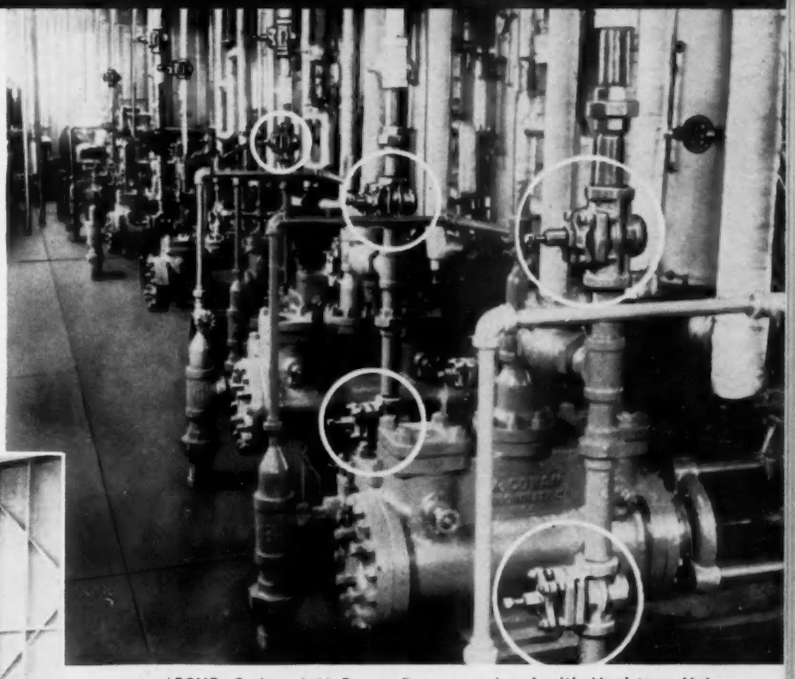
AD Issue

The OIL WEEKLY

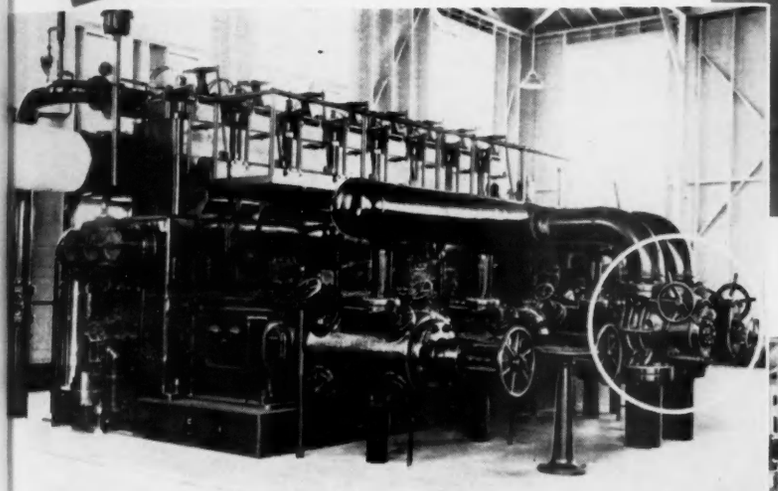
FOR THE DRILLING, PRODUCING ... INDUSTRY

VALVING
PUMPS and
COMPRESSORS
with
NORDSTROMS
Keep Upkeep Down



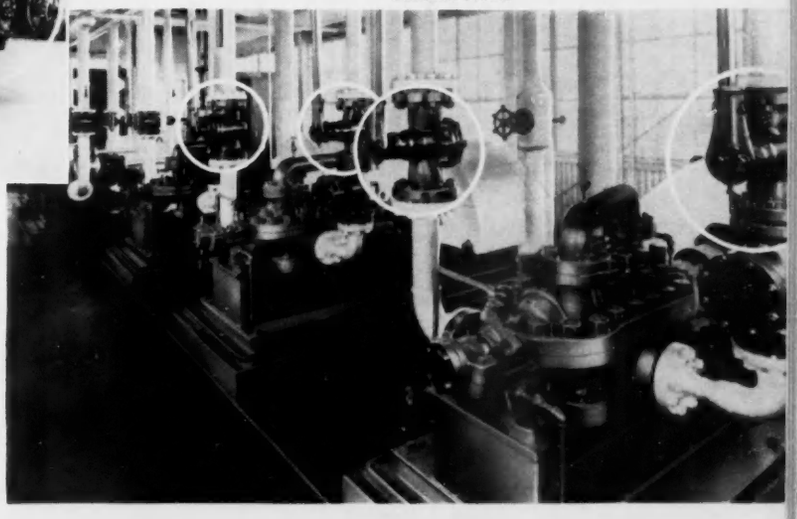
ABOVE: Series of McGowan Pumps, equipped with Nordstrom Valves on Suction and Discharge Lines.

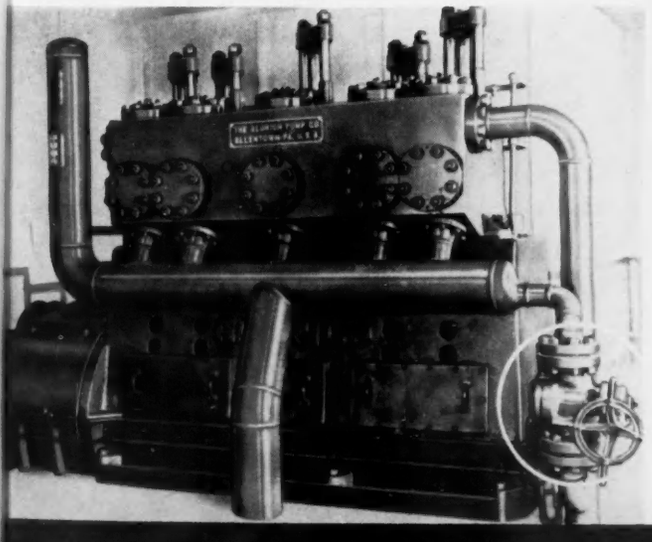
BELOW: Ingersoll-Rand 6-Stage Pumps, Nordstrom-equipped, driven by Terry 10 HP Steam Turbines, handling lean oil to still in a Natural Gasoline Plant.



ABOVE: Clark 8-Cylinder, 1600 BHP Gas Engine-Driven Compressor, equipped with Nordstrom Valves.

BELOW: Aldrich Inverted Quintuplex 400 HP 8" Stroke Pump, fitted with Nordstrom Valve used as a by-pass valve for starting against no load.





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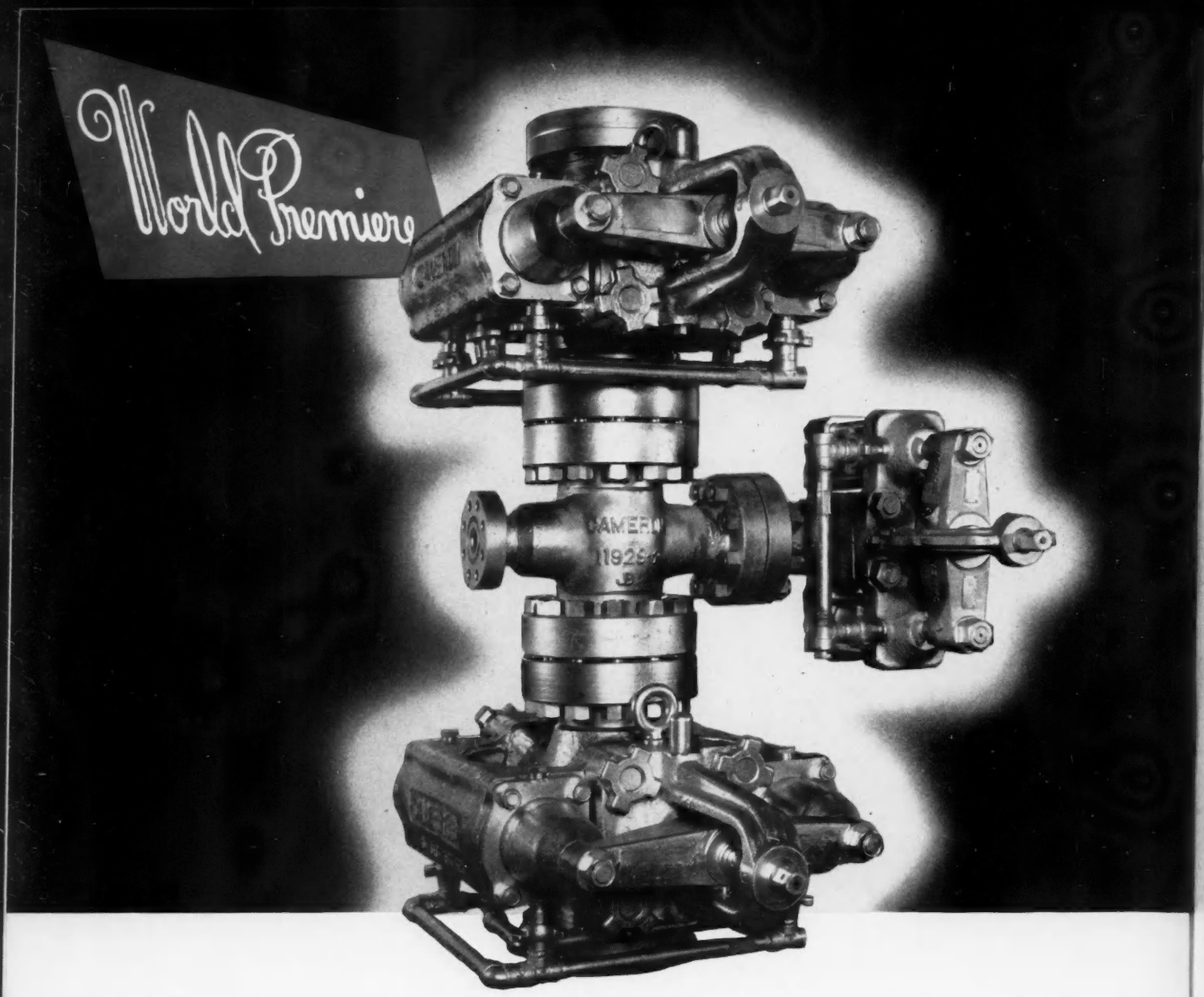

CAMERON 10,000 LB. TEST HOOKUP WITH A NEW HIGH RATIO FLOW-LINE VALVE

Type "HCR" Pressure Operated Gate Valve Makes Fine Team-mate for Cameron Type "QRC" Blowout Preventer

This new Cameron Series 1500 API, 10,000 lbs. Test, Pressure-Operated Drilling Control Assembly is available for immediate delivery with 6" and 10" Type "QRC" Blowout Preventers and 4" Type "HCR" Flow-line Gate Valve. (The new Type "HCR" Flow-line Gate Valve will soon be available in 6" size, which size may also be used as a drilling master gate above 7" o.d. casing if desired.)

While the Cameron Type "QRC" Pressure-Operated Blowout Preventers have been available for some time in the higher pressure range, it was only recently that the new Type "HCR" (High Closing Ratio) Gate Valve was announced to the industry, thus matching the "QRC" Preventer with an equally efficient means for protecting the flow-line.

A feature common to both the blowout preventer and gate valve is the more favorable ratio of closing pressure to well pressure . . . 8 to 1 as compared to 3 to 1 on earlier models. Only 1000 lbs. closing pressure is required to close the preventer or the valve against approximately 8000 lbs. well pressure. Furthermore, the Type "HCR" Valve, having a 4 to 1 ratio of *opening* pressure to well pressure, may be easily opened against high well pressures should it become necessary to relieve pressure through the flow-line.

Because of the quick ram change feature of the Type "QRC" Blowout Preventers, which actually save sufficient rig time to pay for themselves, and the extra margin of safety provided by the more favorable pressure operation ratio, it is sound economy and in the interest of advanced safety to replace old model drilling control equipment with these new and proven Cameron units.

Complete details will gladly be sent to interested operators on request.

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THE UNIVERSITY OF TEXAS

20th Public Auction Sale of Oil and Gas Leases

Tracts located in Andrews, Hudspeth, Crockett, Irion, and Pecos counties; date of sale, December 14, 1946; to be held at the Stephen F. Austin Hotel, Austin, Texas, to begin at ten o'clock A.M.

For additional information write to the Secretary, Board for Lease of University Lands, University Station Box 2125, Austin 12, Texas.

Looking Ahead

WITH THE EDITOR

CONTINUING to feature the 26th annual meeting of the American Petroleum Institute held in Chicago November 11-14, THE OIL WEEKLY, in its November 25 issue will publish important technical papers presented at the meeting.

A review of the pipe line industry's role in coping with the tremendous demands made upon the nation during the past war is contained in "Recent Developments in Pipe Line Technology" by H. H. Anderson, vice president, Shell Pipe Line Corporation. "Looking Forward in Oil—World View" by J. Howard Pew, president, Sun Oil Company, is an enlightening paper on the Anglo-American Oil Treaty, its importance to the oil industry, and includes the highlights of the controversial treaty introduced in Congress two years ago.

Ralph L. Gray, Stanolind Oil & Gas Company, presents a summary of five years' operation under a gas-injection program in Southern New Mexico in his paper, "A Review of Five Years of Operation at the Langlie Unitized Repressuring Project."

"Distribution Systems and Surface Injection Equipment in Secondary Recovery" by C. H. Keplinger of Keplinger and Wanemacher, Tulsa, gives considération to distribution sytems and well-injection equipment for secondary recovery. Continuing the subject of injection is a paper by L. L. McWilliams, Phillips Petroleum Company, entitled "Source and Purification of Gas Supply," which deals with the types and sources of gas for injection in repressuring programs.

Part 5 of Hubert Guyod's series, "Temperature Well Logging," will appear in the issue of December 2, as will Part 13 of C. L. Hightower's "Fundamentals of Industrial Accident Prevention."

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PETROLEUM REFINER and The REFINERY CATALOG for the refining-natural gasoline industry

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The OIL WEEKLY

ENGINEERING NEWS STATISTICS

R. L. DUDLEY, President, Publisher A. L. BURNS, General Manager

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THE CHANGING Panorama

Petroleum Engineer Field Is Wide Open

OPPORTUNITY is knocking at the door of the young American who will make petroleum science and engineering his career. Already, thousands of returning GIs have enrolled in petroleum technical courses and good jobs will be available for those who graduate for many years to come.

Oil executives as well as prominent educators estimate that the war interrupted the studies of 150,000 young men interested in petroleum engineering and technology. It created a vacuum in this branch which must be filled, and quickly, if the American oil industry is to maintain world leadership.

An indication of the broadness of this field is seen in the rapid growth of the research staff of Standard Oil Development Company. In 1936 this company's research staff numbered 458 men and women; today it numbers 1900, and still further increases are expected when necessary facilities and personnel are available.

The field is open, not only to young men, but to young women. Visits to any research center in the country will disclose that women engineers are making outstanding contributions to the industry. The field is wide open and it is to be hoped that Young America will recognize the opportunity and take hold of it.

Review Invited of World Oil Experience

THE action of the British socialist government in proceeding slowly with some of its nationalization plans, particularly, as we are told, in regard to petroleum, shows a practical approach which is well founded.

Oil, privately found, produced and refined, did more toward saving the British people from slavery than any other single product. Private management came through for Britain—and civilization.

We should think that even a labor government, even a socialistic government, would be inclined to view the experience of the world in such a vital thing. If the experience of the world, the experience of governments elsewhere is reviewed, it will be seen that nowhere has governmental operation of petroleum been anything like as efficient as private ownership.

Competition at Root Of Living Standards

COMPETITION, rather than abundance of natural raw materials, is the basis for the high American standard of living, members of the Advertising Club of Washington were told recently by R. T. Haslam, vice president of Standard Oil Company (New Jersey), in summarizing his observations on trips to 15 countries in the past ten months.

Competition in America, he said, differs from that in other countries in that it exists at all levels and in all directions, with geographic areas, industries, corporations, new inventions and people all competing.

Oil competes vigorously with coal as a fuel, he pointed out, and has motivated the coal industry to set up a research organization to find ways of in turn invading oil markets. Tomorrow, he said, atomic power may compete with oil as an energy source, but the petroleum industry "is not in despair" and "believes that ample opportunity will be found for the use of all energy sources and that, even if the atom should supplant petroleum in some cases, it will be entirely possible to find new and useful employment for the oil thus displaced."

The lack of opportunity for competition in foreign countries, which has slowed down their economic expansion, is being recognized in some countries, Haslam said.

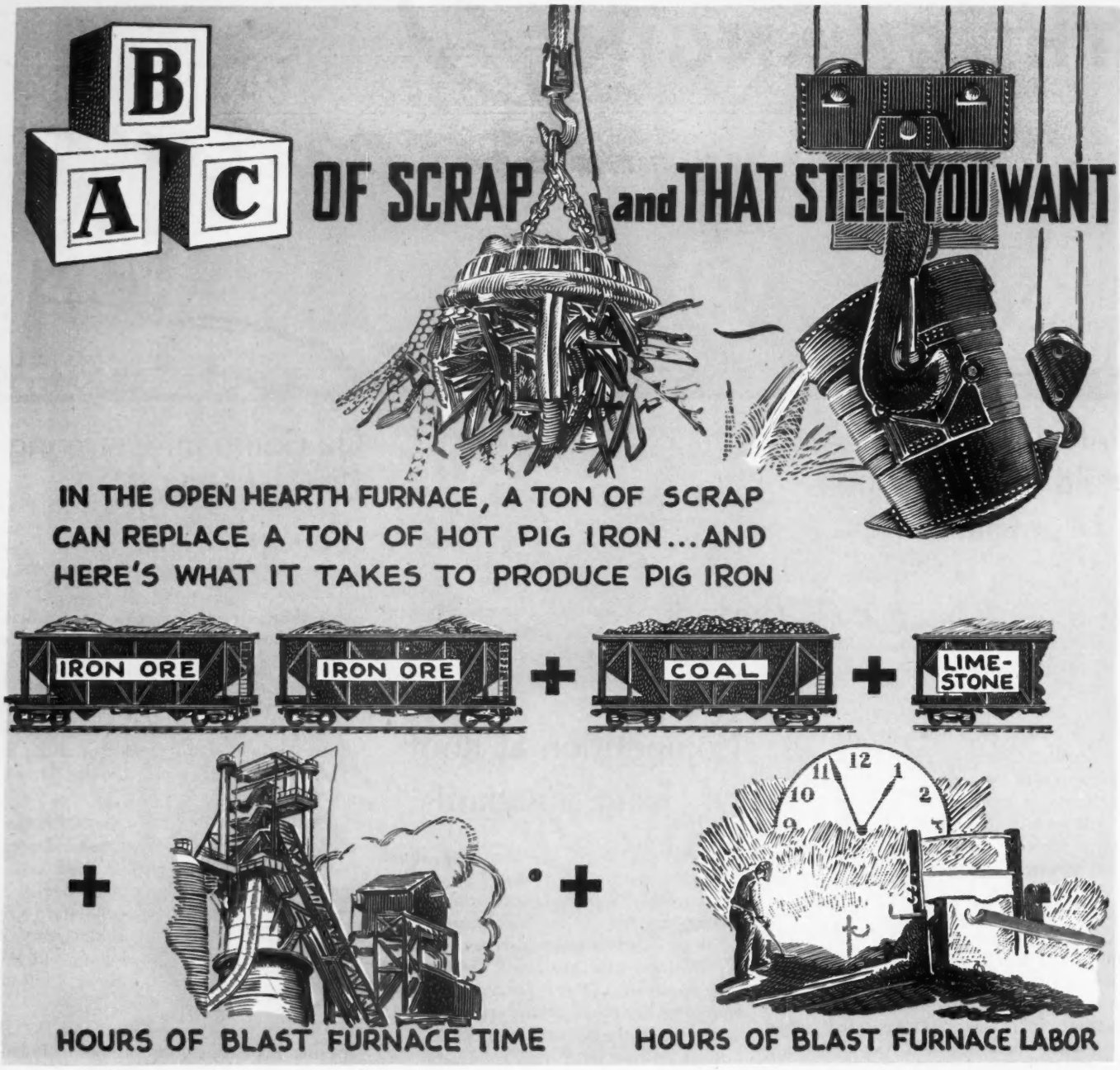
Oil Companies Among Largest in U. S.

THE oil industry is correctly described when it is referred to as "big business," representing the capital of thousands of smaller investors as well as larger investors. The industry represents an impressive segment of U. S. industry in general, has a considerable number of the nation's largest companies among its operators, and holds the distinction of accounting for the largest of all U. S. industrial corporations, based on reported assets.

Out of the first 11 of the largest industrial corporations in the United States, based on assets reported in 1945 statements, six were oil companies. No. 1 among the 11 leaders was Standard Oil Company (New Jersey), with assets of slightly over 2½ billion dollars and the only one reporting assets above 2 billion dollars.

The six oil companies among the 11 leading industrial corporations included, besides Standard of New Jersey, the Socony-Vacuum Oil Company, Standard Oil Company (Indiana), The Texas Company, Standard Oil Company of California, and Gulf Oil Corporation.

Based on information furnished through courtesy of Standard & Poor's Corporation, New York, here are the 11 largest industrial corporations, from the standpoint of assets in millions of dollars as reported in annual statements for 1945: (1) Standard Oil Company (New Jersey), $2532; (2) U. S. Steel, $1891; (3) General Motors, $1814; (4) E. I. du Pont, $1205; (5) Socony-Vacuum Oil Company, $1076; (6) Standard Oil Company (Indiana), $946; (7) Bethlehem Steel, $881; (8) General Electric $858; (9) The Texas Company, $834; (10) Standard Oil Company of California, $738; and (11) Gulf Oil Corporation $653.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A C
OF SCRAP and THAT STEEL YOU WANT
IN THE OPEN HEARTH FURNACE, A TON OF SCRAP
CAN REPLACE A TON OF HOT PIG IRON...AND
HERE'S WHAT IT TAKES TO PRODUCE PIG IRON
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IRON ORE
COAL
LIME-
STONE
HOURS OF BLAST FURNACE TIME
HOURS OF BLAST FURNACE LABOR

TO you "scrap" may be just worn-out machinery, broken pipe and such junk---worth nothing to your business.

But it IS worth a lot to your business delivered to the steel producer. Scrap may be the means of supplying you with more of the new steel and steel products you want.

As every buyer knows, steel is produced by "blending" hot pig iron and scrap in the open hearth furnace. Each ton of available scrap can replace a ton of pig iron. The greater the shortage of scrap, the heavier the drain on pig iron supply to produce a given tonnage of steel.

But every extra ton of pig iron produced calls for the use of approximately two extra tons of iron ore, one extra ton of coal and one extra half-ton of limestone, processed in a blast furnace, involving many extra hours of time and labor. It is obvious that there is a limit to America's blast furnace capacity. So the quickest, most effective way to produce maximum steel tonnage now is to find and use more scrap.

Help yourself to more steel by starting more scrap into the channels that serve the mills.

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The Week's News

SUN Oil Company posts crude increase, effective November 15, in Texas and Louisiana. See below.

Internal Revenue Bureau abandons its contention that the East Alice (Texas) Operating Committee is a corporation and discontinues effort to collect alleged deficiency in corporation and excess profits taxes from the committee and income taxes from operators. Page 12.

Daily demand in 1947 may exceed 1946 by 270,000 barrels, U. S. Bureau of Mines declares. Page 13.

Increased supplies for tetraethyl fluid, batteries and general industrial uses expected as import controls on metal revoked. Page 13.

The Army is developing new petroleum fuels for aircraft in the international race for air supremacy. Page 13.

A net Texas oil allowable of 2,133,618 barrels daily for December is fixed by the Texas Railroad Commission. Page 14.

First test well for Naval Petroleum Reserve 4 in Alaska halts drilling operations, unofficial reports declare, and probably will be abandoned. Page 15.

Chile's fourth Springhill test is located; No. 3 well has high gas-oil ratio yield. Page 15.

The House Surplus Property Committee will bring to light this week whether any undue influences have been brought to bear on the War Assets Administration to prevent the conversion of the Big Inch pipe lines to natural gas. Page 17.

Stanolind Pipe Line Company undertakes one of the largest pipe line construction and extension programs ever carried out in the industry. Page 16.

Control of the natural gas market for the Detroit industrial area—one of the world's richest—may be decided when the FPC hands down a decision on the Michigan-Wisconsin Pipe Line Company's application to build a line from the Texas Panhandle to Detroit. Page 16.

Sun Oil Company Posts Higher Crude Prices for Texas and Louisiana

Following several weeks of tight markets and reported paying of premiums for crude in various districts, officially posted crude oil prices broke into higher ground November 15 when Sun Oil Company initiated a new general revision affecting crudes that it purchases in Texas and Louisiana. Prices were increased 5 to 28 cents a barrel by the new Sun Oil Company schedules.

Although the Sun announcement was made public late November 14, it was not clear late November 15 exactly what action would be taken on crude postings by other major purchasers. However, there was strong indication that other concerns also would increase prices, at least on some crudes and especially on Gulf Coast crudes of high lubricating oil value.

Prior to Sun's general price revisions, there had been a localized revision November 1 in which The Atlantic Refining Company raised Barbers Hill crude (Texas Gulf Coast) 10 cents a barrel above the generally posted gravity-scale prices, making crude below 20 gravity $1.51 per barrel and higher gravities going up by 2-cent differential to $1.81 for 34 gravity and above.

Humble Action Awaited

Humble Oil & Refining Company, largest Texas purchaser and traditional price leader, still had the whole matter of the crude market under consideration late November 15, and some of the other larger purchasers presumably were delaying action pending an announcement by Humble.

From Humble headquarters in Houston it was learned that the company was studying the effect of the advances made by Sun and the earlier advance made in the Gulf Coast by Atlantic on November 1.

It was pointed out that Humble purchases over a wider area than that covered by the Sun and Atlantic revisions and that Humble was in competition with numerous other buyers, making it necessary for Humble to consider carefully the relationship between values and prices of the various crudes it buys and sells.

A spokesman for the Humble company cited reports that premiums have been paid recently for crudes, particularly for lube-quality crudes on the Gulf Coast, and stated that the Sun Oil Company advances for such crudes seemed fully justified.

Sun Oil Company's action in initiating the increases in crude prices was announced in Chicago Thursday, November 14, during the annual meeting of the American Petroleum Institute. The announcement was made by John G. Pew, who is in charge of the company's operations in the Southwest district.

The new prices were posted by Sun effective at 7 a.m. November 15. In announcing them, the company explained that the increases were made "in order to meet competition, thereby enabling it to obtain and retain necessary crude oil supplies, and to bring about certain adjustments to reflect the relative values of various crudes."

Varying Increase

Affected by the Sun revisions were virtually all crudes purchased by the company in fields of Coastal, Southwest, and East Texas and Coastal and Central Louisiana. The adjustment was predominantly a 10-cent increase, although certain grades of crude were advanced different amounts ranging from 5 to 28 cents a barrel. The East Texas, Conroe, Clay Creek and South Cotton Lake fields were given new flat price postings of $1.70, $1.88, $1.45, and $1.80 per barrel, respectively, a 10-cent increase in each case.

For Coastal Grade "A" crude, Sun's new schedule priced oils below 24 gravity at $1.69 per barrel, with a 2-cent differential per degree of gravity to a top price of $1.81 for oils of 29 gravity and above. This was a new breakout of these select crudes, which formerly had been purchased on the same basis as other coastal crudes, and involved increases of 20 cents for crudes between 24 and 29 gravity and as much as 28 cents for crudes below 24 gravity, while the increases ranged down from 20 cents for crudes above 29 gravity.

For "Texas and Louisiana Gulf Coast" fields, Sun posted $1.59 per barrel for crudes below 24 gravity, 2-cent differential to $1.93 for 40 gravity and above. This was a 10-cent raise for all grades except those under 24 gravity, which were advanced 10 to 18 cents, since the former schedule graded the heavier oils down to $1.41 for crudes below 20 gravity. Reference to Sun's former schedule showed that in this group the company listed Barbers Hill, Batson (Old), Bayou Blue, Belle Isle below 36 gravity, Chacahoula, Cotton Lake, Cottonwood, Esperson below 35 gravity, Gilbert Ranch, Goose Creek, Hackberry East and West, Hull below 25 gravity, Humble below 35 gravity, Kirby Vicksburg zone, Kirby Miocene, LaBelle, Nome, North

THE END IS NOT YET

The Office of Price Administration has warned all producers, sellers and buyers of products formerly under price control that they must preserve for one year all records and data required to be kept under the price orders.

In the case of petroleum, on which control ended June 30, this means that records must be retained until that date next year, while with respect to products and commodities on which the controls were lifted by President Truman's general decontrol order, the period will run until November 9, 1947.

Covered by this requirement are "all records, documents, reports, books, accounts, invoices, sales lists, sales slips, orders, vouchers, contracts, receipts, bills of lading, correspondence, memoranda" and other papers required to be kept by any order, regulation or price schedule.

Winnie, Orange, Saratoga heavy, Sour Lake, South Liberty, Stowell, and Vinton.

For Anahuac type crudes Sun posted $1.51 for crude below 24 gravity with 2-cent differential to top of $1.85 for 40 and above. This was a 10-cent increase for all grades except those under 24 gravity which were raised 10 to 18 cents. Sun's former prices ranged down to $1.33 for crudes below 20 gravity. Taking this Anahuac schedule are various fields including Anahuac, Batson new, Caplen, Esperson 35 gravity and above, Fig Ridge, Hull 25 gravity and above, Kirby, Oyster Bayou, Saratoga Light, Seabreeze, South China, South Esperson, Turtle Bay, West Orange 31 gravity and above, and Willow Slough.

Louisiana Fields

For Delhi and related fields of Louisiana, Sun posted $1.36 for crude below 24 gravity and 2-cent differential to $1.70 for 40 gravity and above, thus raising all grades 5 cents except those below 24 gravity which were increased 5 to 13 cents. Previously, the low Delhi posting was $1.23 for oils below 20 gravity. Fields in this category on Sun's schedule include Big Creek, Delhi, West Delhi, and South Big Creek.

For Sweden and other fields of Southwest Texas Sun posted $1.46 for oils under 24 gravity with 2-cent differential to $1.80 for 40 gravity and above. This was a 5-cent advance for all grades except those below 24 gravity, which were raised 5 to 13 cents, as the former lowest listing was $1.33 for crudes below 20 gravity. Included in this group are the following fields: Blucher, Dan Sullivan, East, Flores, Frost, Garcia, North Rincon, North Sun, Seeligson, Sun, Tiiernia-Canales, and Weil.

Mirando grade crude of Southwest Texas was given special treatment by Sun very similar to the posting of Coastal Grade "A." Below 24 degrees gravity was posted at $1.66 per barrel, with 2-cent differential to a top of 29 degrees gravity and above $1.78. On the grades between 24 and 29 gravity this was a 20-cent increase; grades below 24 gravity were raised 20 to 28 cents as the former low posting was $1.38 for below 20 gravity; and grades above 29 were raised by amounts from 20 cents downward, as the former top was $1.80 for 40 gravity and above. Fields in this group included on Sun's schedule are Bennett, North Government Wells, Sarnosa, South Government Wells, Yturria.

Guerra field formerly was included in the Mirando group by Sun, but the company on its new schedule priced Guerra crude from $1.56 for oils below 24 gravity, with 2-cent differential, to $1.90 for 40 gravity and above. This was a 10-cent raise for all grades except those below 24 gravity.

H. S. M. Burns Named Senior Vice President for Shell

H. S. M. Burns, who has been associated with the Shell organization for more than 21 years, has been named senior vice president of the Shell Oil Company, Inc., in the East of Rockies territory, it was announced by Alexander Fraser, president of the company.

Tax Bureau Abandons Claim That Operating Group Is Corporation

In a move seen as having widespread effect throughout the industry, The Internal Revenue Bureau last week abandoned its contention that the East Alice (Texas) Operating Committee was a corporation and discontinued its effort to collect an alleged deficiency in corporation and excess profits taxes from the committee and income taxes from the participating operators.

In this proceeding the bureau took the position that the agreement for the unitization of the East Alice field had the same effect as if the parties thereto had formed a corporation to which they had contributed their holdings.

Had this position been upheld in federal tax court proceedings, the operating committee would have been subject to corporation and excess profits taxes and the operators, as individuals, to income tax on their receipts from the operations, which would have been considered dividends.

The case was of great importance because of the expansion of the unitization plan of operation during the war and its expected continuance in the future, particularly in producing fields in the public lands and in states with strict conservation statutes.

Notices of deficiency were served on some 20 interest-owners in the East Alice field in August, 1945, the bureau claiming additional tax on the ground that the unit operation was an association taxable as a corporation. The interest-owners appealed to the tax court and the cases were set for trial in Dallas November 12.

Prior to trial, there were discussions with Internal Revenue Bureau officials in Dallas, where it was pointed out that the bureau policy always had been not to tax unit operating committees. Because of the fact that the question affected the entire industry and not merely the parties in this case, the Dallas office refused to make a ruling and referred the matter to Washington.

In Washington, Robert Ash, attorney for the interest owners, met with the general counsel and other high officials of the bureau who agreed that the long-established policy should not be disturbed.

As a result, when the cases were called for trial in Dallas, stipulations were filed with the tax court that there was no deficiency, and moving for dismissal.

Anglo-American Oil Pact Scored by Independents

Strong opposition to Senate ratification of the pending Anglo-American Oil Agreement was sounded last week by Houston independent oil operators.

Following a request that the American Petroleum Institute adopt a resolution opposing the agreement at its meeting in Chicago, the Houston oil men carried their fight to the leaders of both the Democratic and Republican parties in the Senate.

H. R. Cullen, one of the largest independent operators in Texas, early in the week praised the action of George A. Hill, Jr., president of the Houston Oil Company of Texas, for his action before API asking Congress to withhold ratification of the pending treaty until appropriate reservations were made. Cullen further threatened to resign from the API if the Institute adopted a resolution asking the Senate to ratify the treaty.

Later, Cullen voiced objections to the treaty in telegrams to Senator Tom Connally and Senator Arthur H. Vandenberg.

In his telegram, Cullen declared that "ratification of this treaty means federal and international control of our domestic oil industry." He cited that the Republican party received a mandate from the people November 5 "to stop regimentation of business and reduce the number of bureaus instead of creating new ones."

H. J. Porter, Houston independent and president of the Texas Independent Producers and Royalty Owners Association, who disapproves of the treaty in any form, wired W. R. Boyd, Jr., API president, that "approval of the Hill resolution by the American Petroleum Institute directors will only tend to confirm the prevalent suspicion that the American Petroleum Institute is run by and for the major oil importing companies and the independent producers will have no other choice than to resign from the API."

Porter also sent a telegram to Senator Connally urging the Senate not to ratify the treaty and that, should public hearings be held by the Senate foreign relations committee, the independent producers be given the opportunity to present witnesses.

Price Paid for Gas at Well Too Low, Texas Solons Told

Charles I. Francis, Houston attorney representing royalty owners in a number of South Texas and Gulf Coast fields, told the Texas Senate natural gas investigating committee, meeting in San Antonio last week, that the price paid for natural gas at the well is generally too low.

Francis declared further that the "smart marketer" is the one that reforms old contracts to the end that the land and royalty owners should get a higher return for the project. He pointed out the importance of clarification of court decisions and policies of the Federal Power Commission if progress in stabilizing the gas industry is to be made.

The investigating committee is composed of Senators T. C. Cadick, chairman; James E. Taylor, Howard Carney, and Wardlaw Lane. Jack E. Ayer, assistant attorney general, conducted the hearing.

1947 Daily Demand May Exceed 1946 By 270,000 Barrels, Bureau Says

Daily average demand for oil next year may be 270,000 barrels greater than estimated demand for 1946, according to estimates prepared by the Bureau of Mines preliminary to a detailed forecast to be issued late this month.

The bureau estimated that 1946 new supply would include daily production of 4,744,000 barrels of crude, 318,000 barrels of natural gasoline and other light oils, and imports of 368,000 barrels, with 140,000 barrels going to stocks, to meet a total demand for 5,290,000 barrels, including exports of 435,000 barrels and domestic requirements for 4,855,000 barrels.

In 1947, it is estimated, total demand will be 5,560,000 barrels daily, including exports of 415,000 barrels and domestic requirements of 5,145,000 barrels. Assuming no change in total stocks during the year, supply is estimated at 4,840,000 barrels daily of crude, 340,000 barrels of other oils, and 380,000 barrels of imports.

With stocks at the close of the third quarter some 46 million barrels greater than at the beginning of the year, the bureau foresaw the most important problem in the immediate future revolving around the level of refinery operations during the winter months. Most of the increase in inventories was developed during the third quarter, when distillate fuel-oil stocks increased about 22 million barrels due to the high level of refinery operations, early stocking by distributors prior to price advances, reduction in normal industrial and shipping operations, and mild fall weather.

The bureau forecast November demand for domestic crude at 4,730,000 barrels daily, a drop of 41,000 barrels from the October forecast to be divided among nine states, with Texas standing most of it.

Requirements for Texas oil were seen as dropping 30,000 barrels from the October forecast to 2,090,000 barrels daily, with Wyoming dropping 3000 barrels to 97,000 barrels, Illinois 2000 barrels to 212,000 barrels, and a 1000-barrel drop in Oklahoma to 383,000 barrels; Louisiana, 382,000 barrels; Kansas, 263,000 barrels; New Mexico, 99,000 barrels; Michigan, 46,000 barrels, and Kentucky, 29,000 barrels.

Demand from the remaining states was seen unchanged, as follows: California, 850,000 barrels; Arkansas, 77,000 barrels; Mississippi, 60,000 barrels; Pennsylvania, 35,000 barrels; Colorado, 32,000 barrels; Montana, 24,000 barrels; Indiana, 19,000 barrels; New York, 13,200 barrels; West Virginia, 8400 barrels; Ohio, 7600 barrels; Nebraska, 800 barrels, and other, 2000 barrels.

Army Developing New Fuels In Air Supremacy Race

An international race for supremacy in the field of jet and rocket propulsion is under way, and the Army Air Forces is actively engaged in exploration of petroleum, chemical and atomic energy fuels, it was disclosed last week by the War Department.

Since the end of the war, there has been a definite shift in the over-all AAF program from conventional engines to jet and rocket propulsion, although research is continuing on piston-type engines as an insurance measure and will continue until jet devices demonstrate the ability to fulfill all tasks now covered by conventional engines.

Besides the development of better piston power plants and more powerful fuels, the AAF is also studying new American-designed turbojet and gas turbine - propeller combinations, advanced versions of pulse jet engines, ram jets, and rocket devices.

Ultimate objective of the research is to develop sufficient power to propel piloted aircraft well beyond the speed of sound, and controlled air weapons many times the speed of sound both in and beyond the earth's atmosphere.

Currently, the AF's fuel research is covering both petroleum and chemicals, but a group has been set up to study nuclear energy propulsion for aircraft as well.

Retires After 40 Years

Robert L. Holmes of Dallas, one of the oldest original employes of the Magnolia companies, will retire December 1 as head of the land and lease records department after 40 years of service. Holmes began his record service on March 6, 1906, as an office boy with the Corsicana Refining Company at Corsicana, Texas, which later became the Magnolia Petroleum Company.

Loftus' Dossier

Files of the State Department reveal the dossier of its Petroleum Division Director John A. Loftus as follows:

John A. Loftus, born Brooklyn, N. Y., August 2, 1911; graduated Catholic University, 1936, Johns Hopkins (Ph.D.), 1940; assistant professor of economics at Holy Cross and associate professor of economics Johns Hopkins; served with OPA and Board of Economic Warfare, 1942-43; recording secretary, U. S. group of experts, preliminary exploratory discussions on petroleum questions (prelude to Anglo-American agreement), April, 1944; delegate at Washington meetings on Anglo-American agreement, July, 1944; appointed special assistant to the director of the Office of International Trade Policy, June 1, 1945, and made director of the petroleum division, September 17, 1945.

Martin Van Couvering Heads Pacific Section of AIME

Martin Van Couvering, Los Angeles consulting geologist and petroleum engineer, was elected president of the Pacific Section of the American Association of Petroleum Geologists at the two-day meeting in Los Angeles November 7 and 8.

Martin Van Couvering

Other officers elected were W. B. Winham, district geologist, Standard Oil Company of California, vice president; and Clifton Johnson, Richfield Oil Corporation, secretary and treasurer.

The Society of Economic Paleontologists and Mineralogists, affiliated group, which held its meeting concurrently with the AAPG, elected W. H. Corey of Continental Oil Company, president, and Miss Jane Everest, Union Oil Company, secretary and treasurer.

Revocation of Import Curbs To Bring More Lead Supplies

Increased supplies of lead for tetraethyl fluid, batteries and general industrial uses are expected to develop rapidly as a result of revocation by the Civilian Production Administration last week of all import controls on the metal.

Simultaneously, the Reconstruction Finance Corporation was directed to discontinue its public purchase program for lead, except for existing contracts, and to terminate its premium payment plan designed to encourage the production of metal from high-cost marginal mines.

At the same time an informal agreement between the United States and Britain since the first of this year limiting the quantities of lead which each could import also will be terminated.

Government officials said that large mines in Australia are now being opened up and considerable quantities of lead should be available from that country in the near future. Throughout the war Mexico was the main source of foreign lead imported to supplement domestic production.

Union Demands Pay Increase From Houston Area Firms

Citing an "unprecedented" rise in the cost of living, nine refineries, pipe lines and rubber companies in the Houston area have been asked for a 25-cent-an-hour increase in wages by the Oil Workers International Union, Local 227, E. W. Johnson, president, has announced.

The OWIU, affiliated with the CIO, has contracts with the Sinclair Refining Company, Crown Central Petroleum Corporation; Sinclair Rubber, Inc., Crown Central Bulk Sales, Maritime Oil Company, Sinclair Bulk Sales, General American terminal, Houston Pipe Line and Sinclair Pipe Line.

2,133,618-Barrel Texas Allowable For December Is Set by Rail Group

A net Texas oil allowable of 2,133,618 barrels daily for December was fixed last week in a proration order issued by the Railroad Commission of Texas. This is a decrease of 130,416 barrels daily from the November figure and considering the estimated underproduction it was 49,733 barrels less than the Bureau of Mines' estimate of 2,050,000 barrels daily.

The decrease resulted from field allowables being based on 23 producing days during December, a 31-day month, as compared with 25 producing days during November, a 30-day month.

Allowable reductions amount to 37,261 barrels in Southwest Texas; 48,402 barrels in the Gulf Coast; 3182 barrels in East Texas (District 5); 6598 barrels for District 6 (Outside East Texas); 10,357 in East Texas; 2008 in District 7-B; 12,952 barrels in West Texas, and 7022 barrels in North Texas.

West Texas District 8 will produce only 20 days during December, the same as for November, while East Texas will continue on 21 days, and the Panhandle is exempt.

Production Estimate

The commission estimated that operators will produce 6.25 percent less oil than is allowed, which will mean an actual production of 2,000,267 barrels, or 49,733 barrels below the Bureau of Mines' figure of 2,050,000 barrels daily. To the actual production will be added 180,997 barrels of distillate and natural gasoline, bringing the state's total to 2,181,264 barrels daily of all oils. The latter figure is 131,264 barrels daily higher than the demand for Texas oils as estimated by the Bureau of Mines.

The allowable for the Bonnie View field, Refugio County, was increased, effective November 1, from 2389 to 3281 barrels daily. This increase was granted pending the outcome of an MER hearing on the field, scheduled for November 19. The Kendall, Matlock and Steed fields in North Texas were assigned 75 barrels per well allowables, effective when present discovery allowable rights expire.

The reduction in allowable was forecast at the statewide proration hearing in Austin preceding the issuance of the order. Purchasers generally remained silent, indicating satisfaction with present rates. Producers, however, evidenced some concern over increasing above-ground stocks, and asked that allowables be reduced.

Nominations by purchasers at the hearing totaled 2,438,087 barrels daily, an increase of only 2129 barrels over November. Demands for South Texas and North Texas were up slightly while indicated demand for Gulf Coast and Panhandle crudes were below the November figure.

Ed Kadane, representing North Texas operators, and H. J. Porter, president of the Texas Independent Producers and Royalty Owners Association, asked that allowables be kept in line with Bureau of Mines' estimates.

The average weighted bottomhole pressure for the East Texas field increased 4.28 pounds during October—from 1,013.50 pounds to 1,017.78 pounds per square inch. The daily average allowable for this period was 318,412 barrels while the daily average salt water injected during October was 448,873 barrels—12,112 barrels more than during September.

The next statewide hearing has been scheduled for December 20 at Austin.

MER Hike Asked

An increase in the MER figure for the Gillock field of Galveston County, Texas, was requested by Coast Petroleum Company and Three Bee Investment Corporation at a hearing before the commission last week. The MER figure and consequently the field allowable were reduced as a result of a hearing held July 30, 1946, at which Humble Oil & Refining Company, the only operator to appear, presented evidence concerning its own production.

Although pressures in the four oil producing reservoirs in the field have declined substantially, it was the position of operators that an increase in the MER figure from 2500 to 3700 barrels per calendar day is not out of line with the drop experienced.

Ratio Order Revised

The Texas Railroad Commission's solution ratio order for the Bertram and Wardner sand reservoirs in the Stratton field, Nueces, Jim Wells and Kleberg counties, Texas, which became effective November 15, was revised last week.

The revisions provide that the allowable for gas wells on 40-acre units will be that amount obtained by multiplying the allowable of an oil well on 40 acres by the volumetric displacement occasioned by production of one barrel of stock tank oil, converted to standard cubic feet of gas. In this connection, where all the gas from a reservoir is returned to the reservoir from which it was produced, net volumetric displacement is permitted. This net figure is determined by subtracting the dissolved gas-oil ratio of each respective reservoir from the volumetric displacement created by the production of one barrel of stock tank oil converted to standard cubic feet of gas.

Crude Production in United States

(Estimates compiled by THE OIL WEEKLY. All figures indicate daily averages in barrels.)

STATE OR DISTRICT	PRODUCTION IN WEEK ENDED November 16	November 9
Alabama	1,000	1,000
Arkansas	73,850	73,450
California	875,000	868,600
Colorado	36,250	38,600
Florida		*
Illinois	192,650	206,900
Indiana	19,300	18,800
Kansas	269,900	267,450
Kentucky	30,150	30,3250
Louisiana	400,350	399,850
North Louisiana	91,000	90,500
South Louisiana	309,350	309,350
Michigan	46,300	48,500
Mississippi	78,900	77,700
Missouri	100	100
Montana	23,750	23,500
Nebraska	750	750
New Mexico	101,000	101,000
New York	13,500	14,900
Ohio	8,200	8,400
Oklahoma	365,200	363,250
Pennsylvania	35,500	39,000
Tennessee	35	35
Texas	2,096,755	2,102,255
Tex. R. R. Comm. Districts:		
Dist. 1—S. Central	18,985	18,985
Dist. 2—Lower Gulf Coast	147,200	147,200
Dist. 3—Upper Gulf Coast	464,325	464,325
Dist. 4—S. West	226,325	226,325
Dist. 5—E. Central	36,835	36,835
Dist. 6—E. Texas Field	324,000	324,000
Dist. 6—Rest of N. East	105,075	105,075
Dist. 7-B—W. Central	35,300	35,300
Dist. 7-C—West	29,510	29,510
Dist. 8—West	507,250	512,750
Dist. 9—N. Central	121,400	121,400
Dist. 10—Panhandle	80,550	80,550
West Virginia	7,900	7,800
Wyoming	108,500	109,500
Total United States	4,784,840	4,801,590

* Wells shut-in.

Total stocks, foreign and domestic, November 9, as reported by the Bureau of Mines were 221,302,000 barrels.

Chicago Corporation Order May Go to Higher Court

Attorneys for the state of Texas have indicated that the temporary injunction and restraining order granted The Chicago Corporation last week in its suit against the Texas Railroad Commission's ratable take order for the Carthage field of Panola County will be taken to a higher court.

Judge Roy C. Archer of the 126th District Court granted the injunction after the commission shut in approximately 30 gas wells in the field for producing in excess of allowables. Attorneys were instructed to draw up a restraining order under which The Chicago Corporation would be permitted to produce that amount of gas which the commission had allocated to unconnected wells in the field.

Largest Area of Public Land Offered for Development

The largest single area of federal public land ever offered for gas and oil development by private industry was made available last week when the Interior Department announced that bids on 20,127 acres, divided into 53 parcels in the Bowdoin field in Phillips County, Montana, would be opened by the Bureau of Land Management November 21.

Leases will be awarded bidders making the best offer of a cash bonus, and in the case of 29 parcels aggregating approximately 8400 acres within the boundaries of the Bowdoin Dome unit areas, successful bidders will be required to enter into an agreement with the unit operator for the development and operation of the lands.

Umiat 1 Halts, May Quit

Unofficial reports indicate that Umiat 1, the first test well for oil on Naval Petroleum Reserve 4 in Alaska has halted drilling operations and probably will be abandoned at its present depth just below 6000 feet. It is said to have passed through at least five sands showing oil or gas, the sands, while showing good saturation, had almost no porosity, being extremely tight and fine-grained sandstone.

Believed to be structurally low, the well will furnish subsurface information of extreme value in correlating results of a projected program of geophysical work and core-drilling to be carried out before deciding upon the next wildcat location for an oil test. The drilling will be carried out by Arctic Contractors, whose general manager is Bart Gillespie, under the supervision and with approval of the Operating Committee.

Meanwhile, geophysical work as well as geological mapping has gone forward, although it will probably be another year or more before all of this work is interpreted and coordinated. At that time, or perhaps before, the Committee will decide what recommendations to make regarding the future operation of the Reserve.

Fourth Springhill Test Is Located; No. 3 Has High Gas-Oil Ratio Yield

Following completion of its third well as a high-gas-oil ratio producer, the Chilean Corporacion de Fomento de la Produccion's fourth test at Springhill has started drilling and is now below 3500 feet, with another 4000 feet to go before it reaches the depth at which production is expected. The new test is 1500 feet east of Springhill 3 and south of the discovery well.

Springhill 3, when first completed, was reported as running slightly more than 100 feet higher on the top of the producing sand than the discovery well and came in making mostly gas with only a relatively small amount of fluid. Meantime, it continued to flow and as it cleaned up started making more fluid until it is now reported yielding a fair volume of oil, perhaps as much as 500 barrels daily, but is still making an undetermined amount of gas. Exact production is not known as there are no adequate facilities for gauging the volume of either the oil or gas, so that any estimate of production is made on the basis of flow during the cleaning-out period. The well has been shut in to await storage.

The discovery itself has been completed for nearly 11 months, but has not yet been accurately gauged. There have been any number of estimates as to the potential producing ability of this well, but these are purely guesswork, since authorities say no extended flowing period has been possible. They believe the yield is not much in excess of 500 barrels daily. However, sufficient tankage and transportation facilities are still lacking.

Producing from pay found at 7419-38 feet, the discovery was originally thought to be in Tertiary pay, but is has been definitely established as Cretaceous sandstone, although the exact member has not been identified. The Springhill area is in the extreme northern portion of the great island of Tierra del Fuego on the Straits of Magellan, and although a number of wells have been drilled in the southern part of Chile during the past 15 years, the majority have stopped in the Tertiary. Most of them are distant from the present area, so that very little regional stratigraphic control is available for determining the exact position of this particular pay in the formation. The second test was dry after failing to find production in the sand corresponding to the pay in Well 1.

Plans for construction of a refinery are still somewhat uncertain, since there are still the problems of supply and financing. It is likely that a final decision will await further development of this field so that some idea of potential output may be gained. When built, it will not be in the vicinity of the field itself, but probably on the mainland and nearer centers of population.

Strike Delays Spudding of Tropical's Colombia Test

Tropical Oil Company is being delayed in spudding its first deep test in the Llanos area of southeastern Colombia by a strike of oil field workers. It had been ready to spud November 1, having moved in a heavy diesel-powered rig just received from the United States, and assembled on the ground after being moved up the Magdalena River to La Dorado.

Located on the Chaviva Concession, in the Central Llanos Department of Meta, this is to be one of the first really deep tests in the Llanos area. Shell Oil Company has drilled a number of relatively shallow wells at San Martin and Chafurray, but this well is scheduled to the 10,000-12,000-foot range for a thorough look at the sedimentary section.

Another operation being delayed by labor difficulties is Tropical Oil Company and Socony-Vacuum Oil Company's Tubara 1, on private property leases in the extreme northern part of the country, northwest of Barranquilla. It had been drilled to just below 5200 feet after having already set casing to protect sands up the hole above 3500 feet which carried showings of oil believed to be sufficient to assure production.

Pantepec to Take Leases On Acreage in Florida

Arrangements have been completed by Pantepec Oil Company of Venezuela to acquire leases on about 4,600,000 acres in Florida.

Constituting the first investment which the company has made outside Venezuela, Pantepec is reported to have paid slightly more than $1 million for the leases. A new firm, the Florida Company, has been set up to own the leases.

The arrangement is subject to approval of stockholders which will be asked at a special meeting to be held November 26 at Caracas, Venezuela.

The leases include all bay waters, inlets, bayous and islands along the shore as well as the beds of a number of rivers that flow into the Gulf of Mexico, the beds of Lake Okeechobee and ten other Florida lakes.

Pantepec is required to drill one well to a depth of 10,000 feet which must be started before February 1. Estimated cost of the well is $250,000.

The whole area leased is subdivided into 51 drilling blocks. The leases are for an initial period of five years, with renewal options and all were obtained from the state of Florida.

Socony Drills Fifth Structure Test in Eastern Venezuela

Socony-Vacuum Oil Company of Venezuela is drilling its fifth in a series of geological structure tests on a 110,000-acre Areo-Caicara block in the state of Monagas, Eastern Venezuela.

The block is on the northern edge of the Orinoco Basin, and north of the shoreline reservoir field of Jusepin, Mulata, Santa Barbara, etc., which constitute one of the principal producing areas of Eastern Venezuela. Some geophysical work has been done here, and operators are now concentrating on structure-drilling the block in an effort to evaluate its possibilities before November 16, 1947, the date upon which it will have to make its selection of exploitation acreage and turn the remainder back into the National Reserve.

After drilling the first three structure tests with a portable rig, Socony has contracted with the Compania Consolidada de Petrolea (Sinclair subsidiary) to act as drilling contractors on the remainder of the series, and Consolidada is now on its second test for Socony, using a heavy rig it employed in developing the Santa Barbara and Muri fields. The holes drilled to date have ranged in depth from 2800 feet to below 5000 feet.

Stanolind Pipe Line Construction And Extension Program Under Way

One of the largest pipe line construction and extension programs ever carried out in the pipe line industry is now under way by the Stanolind Pipe Line Company of Tulsa. The program includes increasing capacities of trunk line facilities, extensions of facilities to new areas and fields, and construction of two refined products lines for affiliated companies.

In May the company commenced looping its main trunk line system from Drumright, Okla., to Whiting, Ind., with 20-inch pipe, to increase its capacity by 42,000 barrels daily, thus making the average total delivery capacity to this main line system approximately 250,000 barrels per day.

Stanolind's present system consists of two 12-inch lines and an eight-inch line. This system will be supplemented by a new 20-inch line from Drumright to Whiting. Up to the present time 148 miles of this new line have been completed between Freeman and LaPlata, Mo., and is now in use. As pipe is received throughout the winter, 119 miles of 20-inch line will be constructed from LaPlata to Manhattan, Ill. When pipe is obtainable, an additional 202 miles of 20-inch line will be laid to fill in the loops and thereby provide a complete 20-inch system extending from Drumright to Whiting, a distance of 632 miles.

Station Being Built

A lateral line from the company's main line at the LaPlata station to Wood River will have its capacity increased by the completion of a station now under construction, and plans provide for another station to be erected in the near future to further increase the lateral's capacity.

Stanolind is buying right of way for the construction of a 45-mile 16-inch extension from the south portion of the Fullerton district, Andrews County sector of West Texas, to Wasson field station and tank farm, NE¼ Sect. 868, Block D, Yoakum County, where connection will be made with its 16-inch trunk line to Drumright and points north.

Stanolind will bypass the Fullerton field, where Stanolind Oil & Gas Company is producing and selling in excess of 3000 barrels daily to Magnolia Petroleum Company, and in return will be assigned Magnolia's gathering system and about 7000 barrels daily in the Fullerton-Devonian 8500-foot field, South Fullerton-Devonian field and the Coopwood sector of the latter, which produces from the Clear Fork. Stanolind is installing gathering lines to link 3 Clear Fork leases of its producing affiliate and will turn the oil to Magnolia until the 16-inch extension goes into service.

Posting Made

Stanolind Oil Purchasing Company made its initial posting for these Andrews County areas effective November 6, paying $1.53 per barrel for 40 gravity and above. This is the same schedule currently used by Magnolia, and involves a split between top prices quoted for West Texas sweet and sour crudes. The Devonian and Clear Fork crudes are classed as semi-sweet.

The entry of Stanolind into Andrews County will be followed, when pipe is available, by a 16-inch extension southeast to Ector County, where Stanolind Oil & Gas Company is producing 19,000 barrels daily from 615 wells in 6 fields. This project will be preceded by the installation of additional booster stations and possibly loops on the 16-inch carrier to Oklahoma as it has been operating at capacity load of 72,000 barrels daily for some weeks.

Rangely Line Planned

The company is considering the expansion of its pipe line system in the Rocky Mountain area, and plans call for a 12-inch line from the Rangely field in Colorado, to Wamsutter, Wyo., to parallel the present ten-inch line of Utah Oil Refining Company, and a ten-inch line from Wamsutter to Casper, Wyo. The program would increase the pipe line outlet from Rangely field from 25,000 to approximately 50,000 barrels per day. Should these proposed lines be built it would then be necessary for Stanolind to expand the capacity of the pipe line system from Casper, Wyo., to Freeman, Mo., by the installation of additional stations on the present line, and the laying of approximately 81 miles of 15-inch, and 116 miles of 16-inch loop lines. This would increase the capacity of the system from 22,000 to 44,000 barrels per day.

Stanolind, in addition to expanding and increasing the capacity of its own crude oil pipe line system, is acting as agent for Standard Oil Company of Indiana in the construction of a gasoline line from Whiting to Moorehead, Minn., via Minneapolis and St. Paul.

The company, acting as agent for the Wyco Pipe Line Company, will start construction next spring of an eight-inch refined products line from Casper to Cheyenne, Wyo., and Denver.

Shell Authorizes Laying of 18-mile, Four-inch Lateral

Shell Pipe Line Corporation has authorized the construction of an 18-mile, four-inch lateral from Douglas station on its East Texas field-Houston ten-inch trunk line to connect with Rusk station of Pure Transportation Company's Van-Smiths Bluffs ten-inch carrier for the former to receive Van crude.

Shell Oil Company controls 3000 barrels daily in the Van field, and is selling 500 barrels daily to Pure, with the remainder moving to the coast on common carrier basis via Pure's carrier. When the connecting line goes into service Shell will take the 2500 barrels daily into its sweet crude carrier, but will erect a 5,000-barrel tank at Douglas station to accumulate stocks for batching to Houston.

Detroit Gas Market Control May Be Decided by FPC Action

Control of the natural gas market for the Detroit industrial area—one of the world's richest—may be decided by the Federal Power Commission when it hands down its decision late this year on the Michigan-Wisconsin Pipeline Company's application to build a pipe line from the Texas Panhandle to Detroit. The application is being opposed by Panhandle Eastern Pipeline Company, which is contending that with its increased facilities it will be in a position to supply 403 million cubic feet of natural gas per day by January 1.

Utility companies, however, have presented evidence to the FPC that on zero temperature days demands would likely approach 500 million cubic feet and would call for at least 435 million cubic feet when certain industrial customers were cut back. A decision is possible by December 1, since an agreement between the Michigan-Wisconsin and Phillips Petroleum Company, whereby Phillips agrees to supply the proposed line with its gas requirements, expires on that date.

FPC has meanwhile temporarily authorized Panhandle Eastern to install additional compressor units along its lines in Kansas, Missouri, Illinois and Indiana.

FPC Hearings on Extending Midwest Gas Service Resumed

The Federal Power Commission last week resumed hearings, already extending over many months, on plans for extending natural gas service in the middle Northwest.

The hearings covered the applications of the Michigan-Wisconsin Gas Company for authority to construct a pipe line from the Hugoton field to Wisconsin at a cost of $85 million and Panhandle Eastern Pipe Line Company for additional facilities to serve to Michigan Consolidated Gas Company at a cost of $23 million. Michigan-Wisconsin was organized by the holding company of Michigan Consolidated to serve it instead of Panhandle.

After completing the submission of technical and other data by company experts, the Commission began the hearing of opposition testimony from coal and other interests.

Texas Permits Issued

Permits to drill 174 new wells in Texas were approved by the Texas Railroad Commission last week. There were 41 in North Texas and 33 in Southwest Texas. West Texas reported 30 permits, and there were 13 from East Central Texas, 17 from the Gulf Coast, 29 from West Central Texas and 11 from the Panhandle.

House Group Would Learn if Attempt Made to Keep Gas Out of Big Inch

Whether there has been any behind-the-scenes maneuvering to prevent disposition of the Big Inch pipe lines for conversion to natural gas is expected to be brought out this week at hearings before the House Surplus Property Committee.

Investigators for the committee already have compiled a voluminous amount of data, including direct information from bidders for the lines as to their financial setup and other factors, on the basis of which the committee plans to probe the entire history of the War Assets Administration's unfinished attempt to sell the lines.

Persistent reports that coal interests—including John L. Lewis, the mine owners and members of the Pennsylvania delegation in Congress — have fought vigorously against any deal which would call for conversion of the lines to gas, will receive the attention of the committee, which has invited such personalities as Lewis, former Interior Secretary Harold L. Ickes, and Former RFC Head Jesse Jones to testify.

Although the report of the Surplus Property Administration to Congress on disposal of the lines held that they should be retained in petroleum service and converted to gas only if not otherwise disposable, and that view apparently—at that time—was concurred in by Army, Navy and Interior officials, the pressure now is for use of the lines for gas.

WAA officials, however, appear to have felt themselves bound by the SPA report and have leaned strongly toward acceptance of the bid of Big Inch Oil, Inc., of $110 million for the lines, which would operate as common carriers of oil, to be supplemented eventually by a 30-inch natural gas line to be built along the same right-of-way.

Better bids, however, were submitted by some of the groups seeking the lines for natural gas, and other factors favorable to conversion were the possibility of marketing large volumes of gas now being wasted in Texas, the lack of assurance that enough oil business could be developed to keep the lines in petroleum transport, and a belief on the part of military officials that the Big Inch systems would not prove the answer to the oil problem of the next war. These were among the considerations which rendered unsuccessful WAA's effort to enlist support of the Big Inch Oil proposal by the short-lived inter-agency special advisory committee.

Meanwhile, Lewis the coal operators and Pennsylvania Congressmen are said to have worked vigorously against use of the lines for gas. It is understood that representatives of the natural gas industry were responsible for rousing the interest of the House committee in the matter.

Maritime Commission Sells Tankers to Oil Companies

Seventeen tankers have been sold by the Maritime Commission under the Merchant Ship Sales Act of 1947, it is shown by a Commission report on 82 sales of war-built vessels.

The vessels so far taken over by private oil interests, the Commission said, are the Hanging Rock, sold to Tanker Sag Harbor; Fort Mercer and New Market to Barber Asphalt Company; Council Grove, One Jack and Abiqua to Cities Service Oil Company; Big Bend and Jordan Valley to Union Oil Company of California; Hampton Roads and Gold Creek to National Bulk Carriers; Fort Casper and Honey Hill to The Atlantic Refining Company; Waxhaws to Sun Oil Company; Frenchtown and Ft. Cornwallis to Standard Oil Company (New Jersey); Brea Olinda to Standard Oil Company (California); and Fort Mifflin to Gulf Oil Corporation.

North Texas Crude Gathering System Is Sold by Cosden

Cosden Petroleum Corporation sold its crude gathering system, consisting of 11 miles of two-inch and a mile of three- and four-inch line, in the Sewell field, Young County sector of North Texas, to The Texas Pipe Line Company for $13,000. This system is connected to 24 leases with 40 wells that average 450 barrels daily, and has been tied into the purchaser's adjacent trunk line outlet. Cosden discontinued operation of its 2500-barrel daily capacity skimming plant in the area last June 1, and will sell the equipment to a salvage company.

Substantial Increases in Steel Prices Not Likely

Barring new wage demands from its workers, the steel industry appears unlikely to make any substantial increase in prices across the board, but around December 1 some companies may announce adjustments for the first quarter of 1947 for products on which little or no profit was made under OPA prices.

Aside from wages, the major uncertainty facing the industry is that of scrap prices, which already have risen materialy, but the shortage of scrap is clouding the issue and some time will elapse before the situation is clarified to the point where steel producers will be able to figure scrap costs definitely, it was said.

Spokesmen for the industry warned that the lifting of price controls will not suffice to bring large additional quantities of steel on the market, since the industry for sometime has been operating within 10 percent of rated capacity. Whether that production can be continued through the remainder of the year, will depend on whether there is a coal strike and, if so, its duration.

Upward tendencies in prices have been noted in copper, zinc, lead and antimony, and an increase is expected in tin.

The policy of the steel industry, it was indicated, will be to maintain prices as close to previous levels as possible, in an effort to avoid runaway markets which might create enough buyers' resistance to start a business recession.

Line from New Gas Field In Russia Being Completed

A 20-mile pipe line connecting Pokhvistnevo with the recently discovered gas deposit near the village of Yablonya, Russia, is expected to be completed before the end of this year. A 125-mile gas pipe line was built during the war from Pokhvistnevo to Kuibyshev.

Meantime, the Soviet press reports that daily consumption of natural gas in the Kuibyshev Province, USSR, averaged about 21 million cubic feet in 1945, and increased to about 25 million cubic feet in the first six months of 1946.

Hope Asks FPC Permit to Add Facilities in West Virginia

The Federal Power Commission has received an application from Hope Natural Gas Company for authority to add four 1000-horsepower compressors to its Cornwell station, and to build a booster station in Doddridge County, W. Va., and construct an additional 45 miles of 12-inch loop line between its Hastings station and Gilmer County, all during the coming year. The firm would also add three further 100-horsepower compressors at the Cornwell station and three 2000-horsepower compressors at the No. 1 plant and six high-pressure compressors at the No. 2 plant of its Hastings station, and build an additional 14 miles of 12-inch loop line from its Jones station in 1948.

The additional facilities, to cost an estimated $4,700,000, are required to enable the company to handle increased quantities of natural gas which it proposes to purchase from the Tennessee Gas and Transmission Company.

Pipe Export Curbed

The Office of International Trade has prohibited exportation without license of seamless and welded casing and oil-line pipe. Effective November 13, export orders in excess of $100 from the so-called "K" countries and $25 from "E" countries will require an individual license before shipment can be made. Group K consists of all countries other than those classified in Group E, which includes Argentina, Bulgaria, Hungary, Roumania, Spain and a number of Atlantic and Pacific islands formerly held by Germany and Japan and the Spanish colonies.

Humble Offices Moved

Offices of Humble Oil & Refining Company at Mobile, Ala., have been transferred to Tallahassee, Fla., which is now headquarters for the North Florida and South Alabama district.

Public Relations Program

ATTENDANCE IS LARGEST IN HISTORY

WHAT the petroleum industry should do to improve its rating in public esteem came into sharp focus at the 26th annual meeting of The American Petroleum Institute in Chicago last week. Numerous speakers discussed various phases of public relations, and before the week was over the directors of the Institute approved the undertaking of an extensive public relations program.

Anglo-American Pact

One resolution of the Board of Directors urged that the Department of State present the Anglo-American Oil Agreement to the Senate only on condition that the document does not give any commission authority to revise existing foreign concessions of American nationals or to give any authority for control of domestic oil affairs.

Another resolution urged that Congress so amend the legislation under which the Federal Power Commission functions that it have authority over only the transportation of natural gas in interstate commerce.

At the annual meeting in 1945 the directors approved a resolution in which it recommended adoption of the Anglo-American Oil Agreement. The resolution at the 1946 meeting set forth what the directors then understood and now understand this agreement to provide. One provision was that neither the treaty nor the act of ratification "Shall confer any power or authority . . . to regulate or control the foreign operations of the nationals of the United States nor in any way to regulate or control the domestic petroleum industry . . . "

Because of recent proposals from the State Department that UNO be given international oil authority the following provisions was put in the resolution that neither the treaty nor the commission "shall have any right or authority either under its own provisions or in conjunction with the Social and Economic Council of the United Nations Organization, to review or revise the foreign or domestic oil concessions and contracts of American nationals . . . "

A third point in the resolution concerning influence on the government was that ratification would not imply that the government of the United States subscribes "to the principle that a world organization . . . shall be empowered to review or revise the lawfully acquired concessions, rights and contracts of American nationals engaged in foreign operations . . . "

The program for the meeting assumed the widest scope in all the Institute's history. In addition to public relations and unusually interesting addresses on general economics and technical operating problems, agriculture was given a place on the program for the first time. As further evidence of its relationship with other industries, the first Gold Medal Award for Distinguished Service was presented to Henry Ford, with Henry Ford II, now president of Ford Motor Company, accepting in behalf of his grandfather.

Registration at the meeting far outdistanced any previous attendance, totaling 3900 in contrast with the previous peak of 3141 established in 1935 at Los Angeles.

API Called Mirror

In his annual address William R. Boyd, Jr., Institute president, classed the American Petroleum Institute as a mirror of the industry, which "cannot by its mere existence guarantee the solution of any problem, since every representative trade association must wait until its membership can come to a substantially unanimous accord about what should or should not be done."

He gave this reason for allowing men freedom in making the decisions that finally make up the opinion in hope of solving any problem:

"Very often men do not know what is the best thing to do and no one is wise enough to tell them. They must take a risk. Initiative and freedom for initiative is the essential ingredient we need, freedom to risk and, if need be, fail—and in failing to be able to do so without recrimination and without punishment for having tried and failed. What government should undertake to guarantee every man is not prosperity but the chance to prosper."

Public Relations

The recommendations of its Subcommittee on Public Relations came before the first general session in a paper by Robert T. Haslam, committee chairman and vice president of Standard Oil Company (New Jersey).

Recommendations contained in the Haslam paper actually assumed the form of a report of a committee of 17, which has studied results of a survey, designed to determine what the public thinks of the petroleum industry. The survey was made by the organization headed by Claude Robinson, president of Opinion Research, Inc., who also spoke at this session.

One significant sentence stated the handicap the industry faces: "The fact is that there is a colossal shortage of understanding about the oil industry." Then Haslam added:

"We propose to increase that understanding. We propose to do it through a carefully planned series of specific steps that will create a constructive, favorable impression of the oil industry in the public mind. We want the public to like the oil industry."

As a means of changing opinion so that "the public will like the oil industry," the subcommittee set about to find a useful theme or characterization. The selection was "Petroleum Is Progressive."

"Here," Haslam explained, "is a true characterization, one we can live with. It is a friendly characterization that will be more effective than any other in meeting present and future issues.

"For example, the progressive character of the industry is its best defense against regulation. A public impressed with that characterization of the industry is apt to think: 'Let it alone, there's no need to nationalize a progressive industry.'"

Advantages of Theme

Advantages of such a characterization, which Haslam was careful to note was not a slogan, were thus enumerated: a progressive industry improves old products, pioneers new ones.

Other observations credited to the characterization were:

"If a public feels that an industry is progressive, there will be little tendency to think of it as making too much money. A progressive industry is, by nature, a competitive industry. Better products and better services are the results of a progressive competitive cycle."

The first attack on opinion status, using the progressive theme, will be directed to three specific issues, on which the survey revealed the lowest degree of understanding.

These opinions are (1) the impression that the industry holds back new developments; (2) the impression that the companies get together to fix prices; and (3) the impression that the industry is a monopoly and that there is not enough competition.

In order to overcome these impressions the program calls for the activity of a staff of "trained public relations merchandisers into the field. We know," Haslam said, "it takes salesmen to sell products. We need salesmen, too, to sell these important ideas."

Men in the Field

This staff of public relations experts will have territorial assignments. They will work with the oil companies in these territories so the "individual companies can make the most effective use of their own facilities and resources. If the companies do not make the most of their opportunities for telling their own story, no one else can do the job for them."

Further, these men will work with

Approved at API Session

existing associations and maintain contact with publishers and editors. The effort will have advertising support and will take advantage of special events as opportunities are available. And a special event has been designed to make the public conscious of the progressive theme, to which Haslam gave the following outline:

"It has been observed by many public relations authorities that what the public thinks of an industry or a company is often determined by two or three big events rather than by thousands of small acts deserving public approbation. We therefore have recommended staging a spectacular nationwide contest to attract the public's attention to the progressive characer of the oil industry. The contest would be for the best brief statement on why the contestant thinks the oil industry is progressive or possibly on what a progressive oil industry means to America."

Champlin on Fundamentals

The general policy of turning to public relations to try to save what they've got, instead of seeing it as a "way to build bigger and better business," was denounced by Ralph C. Champlin, Ethyl Corporation, New York. After declaring that only the efforts of many companies could possibly command sufficient attention and sufficient conviction to improve public esteem, Champlin outlined the fundamentals essential to a successful relations program.

"The public is not interested in what is on your mind," Champlin concluded. "It is interested chiefly in what is in its own mind . . . Let us seek assiduously for those things that are in the public good, and advocate them. Let's be for more things. Let us advocate changes that restore free men to the vigor they need to cope with the world forces of degradation. Let us lead the fight for the liberty of the individual man. Let's talk about him to him. If he achieves liberty, we shall all have liberty without ever mentioning the liberties of business."

At a forum it was brought out that proposed industry's public relations efforts should be referred to as a program of education and not as a campaign. Fred Eldean, public relations counsellor, New York, said it would take three or four months before the staff of field representatives could begin functioning. A panel of industry public relations men and oil editors answered questions from the floor. Most of the questions concerned how the program would be carried out.

Ralph K. Davies, acting director of the Oil and Gas Division of the Interior Department, appeared on one of the general session programs to read an address by J. A. Krug, Secretary of the Interior.

Careful appraisal of the role of imports in the national oil policy was recommended by Secretary Krug.

"The problem of imports," he said in his paper, "is to find a reasonable and proper answer to the question of how much and what kinds of oil we should import. We could bring in too little or too much."

The attitude toward imports was part of a petroleum program for the nation, especially a policy toward the security of the nation in case of emergency, Krug went on to say.

His suggestions were based on the prospect that half the oil resources of the nation have been produced, leaving another 50 billion barrels from domestic reserves. On this matter he said:

"There is a definite limit to the amount of petroleum which can be found in the United States. That amount was determined millions of years ago in geological time."

As part of the domestic policy toward oil Krug recommended that we should "know the maximum efficient productive capacity of the oil wells and fields now in operation."

Backlog Lacking

As a result of high productive rates during the recent war he concluded that "we no longer have a reserve productive capacity large enough to provide a backlog for defense."

Krug recommended that "we appraise the present situation and try to see what it offers in the way of foundations for petroleum security in the future. I have urged the combination of forceful exploration and conservation but more plan than that will be needed.

"One possibility may lie in our stripper wells . . . if techniques of secondary recovery can be advanced sufficiently."

In a further discussion of imports he added:

"Imports, obviously, should not be so limited as to force the operation of our domestic oil fields at levels which exceed the maximum efficient rates and thereby cause physical waste. The extent to which we can produce oil without causing physical waste is one prime factor to be considered in measuring our needs for oil from outside sources. Yet if this is to be the sole criterion for imports, obviously there would be small likelihood of attaining the reserve productive capacity. On the other hand, imports should not be of such magnitude or character as to threaten the economic well-being of the domestic oil industry."

Development of oil reserves of the Middle East brought this observation from the Secretary of the Interior: "the richness and productivity of their oil horizons are of sufficient magnitude to overcome the costs of long ocean hauls and to bring these fields within the orbit of our peacetime oil supply."

State Regulation Advice

Since domestic reserves depend upon state regulation, Krug gave this advice: "the basic responsibility for conservation rests with the states and efforts to fulfill that responsibility should have full support of the individuals and corporations which make up the petroleum industry. . . The enactment and enforcement of conservation laws and regulations by the states should guarantee that this responsibility will continue to rest with the states and render ineffective any clamor for independent federal action.

"I may say to you that my ears would be deaf to such clamor. I do not believe in, nor would I support, any proposal for the federal government to take over the oil industry or the gas industry. Governmental procedure is not suited to the risks, ventures and experimentations which are necessary to successful accomplishments in oil and gas."

Oil's Responsibilities

Eugene Holman, president, Standard Oil Company (New Jersey), speaking at the last general session Thursday morning, listed the economic importance of the industry as secondary "with other qualities more significant." These included optimism, daring and a progressive spirit that has always characterized its activities.

"This country has developed a national economy based to a great extent on oil and we of the industry have a responsibility in keeping that economy operative. In this respect, the customer is our boss and he must be served."

Other industry responsibilities are those to stockholders who look for a return on the investment and to employes, most with special skills. For these, Holman said, "we should strive to maintain stabilized employment with good wages, fair hours and favorable working conditions."

Regarding another obligation, Holman pointed to the estimate of economists that by 1965 the consumption of petroleum products in the U. S. would be 6 million barrels daily. To this must be added a rising consumption in other countries. In analyzing the source of oil for this obligation, Holman said that his company's geologists expect future discoveries of the U. S. to equal those of

1947 Session Scheduled For November 10-13

The 1947 annual meeting of the American Petroleum Institute will be held in the Stevens Hotel, Chicago, November 10 to 13 inclusive. This action was taken by API directors at the annual meeting last week.

Because of the difficulty of finding accommodations for an annual mid-year meeting, the proposal that each of the four divisions of the Institute schedule its own individual mid-year session was given to the executive committee for consideration.

the past. Improved production methods also will help.

"Natural gas also may be regarded as supplementary to petroleum, because hydrocarbon synthesis processing has now reached the point where natural gas is converted into liquid fuel," he went on. "By drawing from only one-third of our present known gas reserves at the rate of 4 percent per year, it is estimated we could produce one-fourth of our current motor gasoline demand by variations of the Fischer-Tropsch process."

He cited gasoline from coal as another source.

Opportunity of accomplishment is the foremost essential in providing what the public requires from oil with freedom to work as a requirement, he said.

"In oil we believe in freedom and competition," Jersey Standard's president declared. "We are opposed to any plan whereby fair and open competition can be restricted. We reject agreements to fix prices, allocate markets or limit production except where production is controlled to avoid waste. Ours is one of the most competitive in the entire economic field.

"We are against monopolies either formed by private companies or by governments.

"We are opposed to waste, the goal of our research and development being more efficient use of our natural resources. But 'locking up' natural resources in vast areas is not our idea of conservation. That is the best way not to have oil available for either present or future use."

Touching on the tidelands matter, Holman said the controversy "is not conducive to the development of possible oil resources in those areas," and that "any decision to set aside the tidewater lands as a 'salted-down reserve' probably means that the oil would be unavailable in an emergency."

Relations with Independents

In his speech Thursday morning Ralph T. Zook, of Sloan & Zook, Bradford, Penn., called upon executives of the larger companies to improve their relationships with the independent producers, saying:

"Your relationship with the smaller units leaves much to be desired. To most of the thousands of oil producers, the hundreds of refiners and the thousands of marketers, you are names only. Far too many of them regard you as the heads of large, soulless corporations instead of just plain good citizens with the same motives, desires and ambitions to do as good a job as any of the more humble in the affairs of the oil industry."

Zook said that better understanding could be attained only by contact between executives of the larger companies and the individuals who make up the independent wing of the industry.

"The independent producer is of importance to the major oil company. He has led the fight for sound oil and gas conservation laws and development of our oil reserves by secondary recovery methods. He has insisted that we must not be dependent upon foreign oil."

Zook made a plea for freedom of enterprise in oil by saying:

"The pages of history show us there is a tried and proven course for oil abundance. It is reliance upon the skill and enterprise of the domestic industry. There is ample reason to believe that it will continue to be successful in the foreseeable future so long as the door of opportunity is left open to the industry.

"The industry recognizes its responsibilities and knows that they are heavy ones. It knows that every policy and every action of every company and individual in the industry must be balanced in the scale of the public interest. It knows its responsibility is to devote maximum, constant efforts to find, develop, produce, refine, transport and deliver—at fair prices—all the petroleum that this nation needs, whether for peace or for war."

W. R. Finney Succeeds Hull as Head of Pipe Liners Club

W. R. Finney, pipe line advisor for Standard Oil Company (New Jersey), was elected president of the Pipe Liners Club last week at the annual meeting of the American Petroleum Institute. He suceeds B. E. Hull of Houston, president of The Texas Pipe Line Company.

W. R. Finney

D. D. Irwin, president of Pure Transportation Company, was elected vice president, and Oliver C. Klinger, Oildom Publishing Company, was reelected secretary-treasurer.

Elected to the Board of Governors were Clark H. Kountz, vice president of Sinclair Refining Company; N. C. McGowen, president of United Gas Pipe Line Company; Burt R. Gay, president of Northern Natural Gas Company, Finney and Hull.

Pew Denounces Collectivism

J. Howard Pew, president of Sun Oil Company, in discussing future prospects of the petroleum industry from a worldwide viewpoint, said the industry could "rejoice over the bright outlook. Internally our industry today is better equipped to fulfill the opportunities of the future than ever before. We have ample crude supplies to meet all domestic requirements for the foreseeable future."

From the international viewpoint he saw in threatened trade agreements "a shadow with potentialities of evil that threatens to destroy all the bright hopes which our industry cherishes for many years of continued service to the American public."

"Any evil intent is disclaimed, but the nature of the pattern which is being followed has its origin in the collectivism and managed economy of the supreme all-powerful state," he said.

"Much of our government's approach to the world's postwar economic problems is away from the tried and true American system and towards compromising with, if not embracing, restrictive collectivism. Too many men in our federal government are without faith in the ability of competitive enterprise to serve adequately the needs of our people."

What this meant to oil brought this observation:

"Oil long has been of particular concern to the economic planners.

"Recent events indicate that instead of being over, the battle to subject our industry to a superstate cartel has just begun."

Pew's analysis of the first Anglo-American Petroleum Agreement and the substitution of a second was described as:

"This second draft was acceptable to the industry, by and large. Standing alone it could not be used as a vehicle for restrictive control of the industry. The British accepted this revised agreement. The Senate has not yet acted.

"There the matter stood until last August when State Department spokesmen, including Charles B. Rayner, in a radio broadcast made clear their thought that this agreement was not to be the final solution of the controversy but, in effect, was 'only the first step toward the world-wide agreement we need.'"

Rayner "two weeks ago appeared before the IPAA to disavow any intent to extend governmental control," he commented, adding:

"Let me say, either he has suffered a severe lapse of memory on that occasion as to what has transpired in this field in the last 20 months or he deliberately undertook to deceive his audience."

Industrial Cooperation

One of the general sessions was devoted to the theme of cooperation with other industries, rubber and automotive. The speakers were Alfred P. Sloan, Jr., General Motors Corporation; T. G. Graham, The B. F. Goodrich Company, and Reese H. Taylor, Union Oil Company.

Sloan used the topic, "Why the Confusion?" His interpretation was that confusion came when, on October 30, 1945, the national policy was defined thus:

"Wage increases are imperative.

"We must, above all else, hold the line on prices."

After discussing the inconsistency of this, he offered a solution for what has come out of the effort to maintain prices and increase wages as follows:

"In view of what has happened, the constructive thing to do, and probably the only way out of the mess we planned for ourselves is to eliminate all wage, price and other controls involved in production and return to a free competitive economy and the law of supply and demand."

After analyzing the contributions of the petroleum industry in making its products available at consistently low prices, in ample quantity and with improved quality, Taylor pointed to the system of free enterprise as deserving most credit for this accomplishment, saying:

"Most of the credit should go to our American way of life. Most of the credit, I believe, should go to the economic system that has encouraged all men and all industries in this country to achieve the greatest possible progress."

Rubber Competition

Graham, of Goodrich, recommended free competition between crude rubber and American-made rubber and other materials, declaring "the peoples of the world should be the ultimate beneficiaries of the war-born, large-scale competition between crude rubber and American-made rubber which will give for broader markets and increased employment."

With this in mind, he suggested that

(1) crude rubber be returned to a free-market basis "as soon as possible and reasonably soon," and (2) that the government proceed with its policy of selling or leasing to private industry such war industries, but with safeguards set up to insure minimum production and standby capacity vital to the nation's security.

Serving the Public

Public opinion also came into a session of the Institute devoted to taxation, with L. S. Wescoat, vice president, The Pure Oil Company, advising that it be made certain that in solving problems which involve governmental policy that the solutions meet public favor. Wescoat dealt with the problems of the industry and of the public in regard to limited access highways and off-street parking.

Likewise, Robert Ramspeck, Air Transport Association, speaking at the same session, based his remarks on the proposition that public interest be considered in solving problems that affect both petroleum and air transportation.

Both industries, Ramspeck explained, are engaged in business of serving the public, and "such policies as we adopt and advocate must coincide with the best interests of the public.

"We both believe in the private enterprise system which has brought to our country the highest standard of living known in the world. We should not permit it to be swept aside through governmental action or by failure of the system to properly serve the needs of the people. It can survive only so long as it serves the public."

Oil men were urged to think about the relationship between what people eat to human well being and the relationship of what people eat to agriculture, industry and labor, by H. E. Babcock, chairman of the Board of Trustees of Cornell University.

After pointing out how government bureaucracy had upset the mechanics of a free market and caused degrading of the American diet, Babcock asserted that "some labor troubles, some riots and a good many crimes, may be but expressions of an inadequate and unpalatable food supply."

Definite recommendations as to contributions the petroleum industry can make in the improvement of agriculture came at one session. John L. McCaffrey, president of International Harvester Company, analyzed the immediate improvement in farm machinery, and urged that the Institute embark upon a consumer-education program among farmers. "Pursue vigorously," he continued, "your already declared purpose to study the use of insecticides, fungicides and other chemicals for the control of crop and plant diseases and pests."

Arthur Turner Heard

Contributions of petroleum and agriculture to each other was made clear by Arthur W. Turner, assistant chief in charge of agricultural engineering, U. S. Department of Agriculture. "Each industry has nurtured the other," he stated. "Each refinement in tractors brought with it better fuels and lubricants to insure greater power and smoother performance. The improvements contributed by each industry in turn brought new customers for the other.

Interest Shown In Transportation

The Transportation Session of the Division of Transportation, B. Brewster Jennings, Socony-Vacuum Oil Company, Inc., New York City, presiding, testified to the growing importance attached to the problem of transporting petroleum and its products by turning out an overflow meeting which not only crowded the meeting room but also jammed the adjoining anteroom and corridor at the API convention in Chicago last week.

Donald D. Conn, Transportation Association of America, Chicago, with the development of that association as subject, and Fayette B. Dow, American Petroleum Institute, New York City, with the subject, "The Current Inquiry Into Our Postwar National Transportation Policy," presented views indicating eventual nationalization of our transportation facilities unless active and continuing effort be directed against such procedure on the part of regulatory authorities.

S. F. Niness, Leaman Transportation Company, Downingtown, Penn., discussed "Transportation of Petroleum Products by 'For-Hire' Carriers." The speaker pointed out that most companies had found it economical, if full-time hauling was not provided by their needs, to utilize a "for-hire carrier" who was able to combine that job with two or more others and thus spread the operating and maintenance costs over greater bulk transported than could the individual company.

"Recent Developments in Pipe Line Technology," discussed by H. H. Anderson, Shell Pipe Line Corporation, Houston, lists many of the noteworthy developments in pipelining technique which have been devised to help meet wartime needs and in the attempt to keep the lines abreast of industry demands for greater volume.

API Production Session Stresses Practical Operating Practices

Headlined by a nine-paper symposium on secondary recovery, and by a four-part study of maintaining and increasing injection rates of water-input wells, the various sessions of the Division of Production at the 26th annual meeting of the API stressed practical and operating considerations with special emphasis on the growing importance of increasing yields from known sources and on the need for conserving the entire potential of already discovered reservoirs.

Chairmen on the production problems were H. H. Kaveler, Phillips Petroleum Company, Bartlesville, Okla., and R. J. Sullivan, The Carter Oil Company, Tulsa. Presiding at the symposium on secondary recovery were Paul D. Torrey, Houston, and George H. Fancher, University of Texas, Austin. The session on drilling and material problems had as presiding officers Lot Bowen, Western Gulf Oil Corporation, Los Angeles, and J. M. Cooper, Gulf Oil Corporation, Houston. The session on production technology had as chairmen Norris Johnston, General Petroleum Corporation, Los Angeles, and K. H. Andresen, South Penn Oil Company, Bradford, Penn.

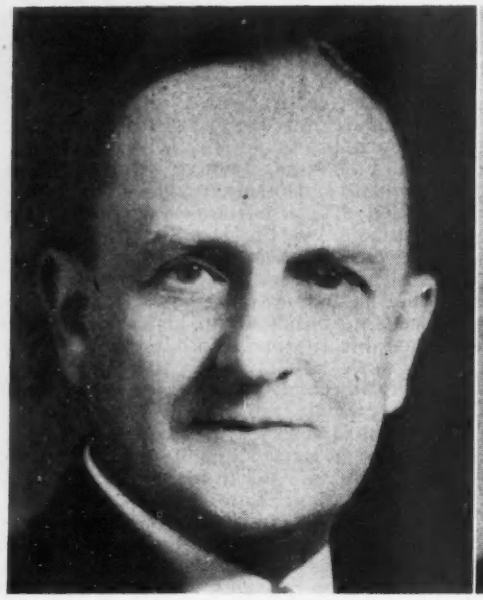
Three papers were included in the program on production problems. They were "Reservoir Performance and Well Spacing — Silica Arbuckle Pool," by Lincoln F. Elkins, Continental Oil Company; "Gas-Condensate Reservoirs—A Review," by O. F. Thornton, The Texas Company; and "A Study of the Flow of Homogeneous Fluids Through Ideal Porous Media," by J. C. Calhoun, Jr., University of Oklahoma, and S. T. Yuster, The Pennsylvania State College.

Papers presented during the symposium on secondary recovery included "Utilization of Old Wells" by W. A. Heath, Earlougher Engineering, Tulsa; "Use of Explosives in Secondary Recovery," by R. C. Earlougher, Earlougher Engineering, Tulsa; "Source and Purification of Gas Supply," by L. L. McWilliams, Phillips Petroleum Company; "Pumping Equipment Selection for Secondary Recovery Developments," by E. N. Kemler, Southern Research Institute, Birmingham; "Separators and Tanks," by W. L. McCloy, Jr., Standard Oil Company of Ohio; "Flowing Water-Flood Production," by T. F. Lawry, The Ohio Oil Company; "The Use of Plugging Agents," by H. T. Kennedy, Gulf Research and Development Company; "Distribution Systems and Surface Injection Equipment," by C. H. Keplinger, Keplinger and Wanenmacher, Tulsa; and "A Review of Five Years of Operation at the Langlie Unitized Repressuring Project," by Ralph L. Gray, Stanolind Oil & Gas Company, Hobbs, N. M.

Other papers presented during the production division sessions were:

"Corrosion and Preventive Methods in the Katy Field," by R. C. Buchan, Humble Oil & Refining Company; "Factors Influencing the Leakage Resistance of Threaded Pipe Joints," by E. N. Kemler, Southern Research Institute; "Practical Aspects of Directional Drilling," by D. K. Weaver, Wilshire Oil Company, Inc., Norwalk, Calif.; "Input Well Equipment," by George W. Holbrook and W. H. Young, Bradley Producing Corporation, Wellsville, N. Y.

"Advantages of Increased Injection Rates of Water-Input Wells," by P. A. Dickey, The Carter Oil Company, and J. F. Buckwalter, Ryder-Scott Company, Bradford, Pa.; "Effect of Properties of Flood Water on the Rate of Input and Oil Production," by Kurt H. Andresen, South Penn Oil Company, and E. T. Heck, Quaker State Refining Company, both of Bradford, Penn.; "Chemical and Mechanical Treatment of Water Input Wells," by Robert S. Bossler, Brundred Oil Corporation, Ottawa, Kansas, and S. S. Taylor, U. S. Bureau of Mines, Franklin, Pa.



W. R. BOYD, Jr.
President

JAKE L. HAMON
Vice President for Production

B. L. MAJEWSKI
Vice President for Marketing

Boyd, Jennings Re-elected

API Names Three New Vice Presidents

W. R. Boyd, Jr., was re-elected president of the American Petroleum Institute last week at the annual meeting of API in Chicago.

Jake L. Hamon, Dallas independent operator, was elected vice president for production, succeeding George A. Hill, Jr., president of Houston Oil Company of Texas.

Dr. Robert E. Wilson, Standard Oil Company (Indiana), was named vice president for refining, replacing Arthur Pew.

B. L. Majewski, Deep Rock Oil Corporation, was named vice president for marketing, a position previously held by Eric V. Weber.

B. Brewster Jennings, Socony-Vacuum Oil Company, was re-elected vice president for transportation.

L. S. Wescoat, The Pure Oil Company, was elected treasurer, succeeding O. D. Donnell.

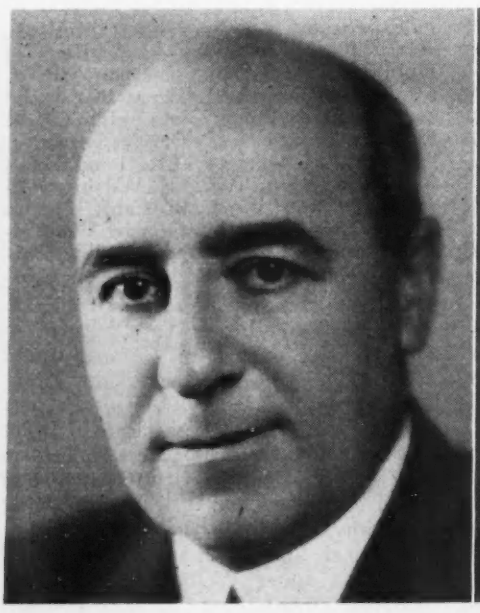
Lacey Walker was re-elected secretary and assistant treasurer.

Executive Committee

Following are the new members of the Executive Committee:

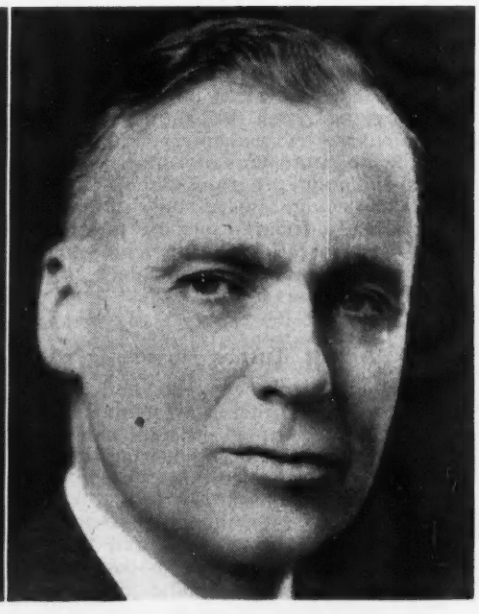
Walter S. Hallanan, Plymouth Oil Company, Pittsburgh; O. D. Donnell, The Ohio Oil Company, Findlay, Ohio; George A. Hill, Jr., Houston Oil Company of Texas, Houston; J. Howard Pew, Sun Oil Company, Philadelphia; A. C. Mattei, Honolulu Oil Corporation, San Francisco; W. H. Ferguson, Continental Oil Company, Denver; W. K. Warren, Warren Petroleum Corporation, Tulsa; J. C. Donnell, II, The Ohio Oil Company, Findlay; C. L. Henderson, The Vickers Petroleum Company, Wichita, Kansas.

Following are the newly elected members of the board of directors:

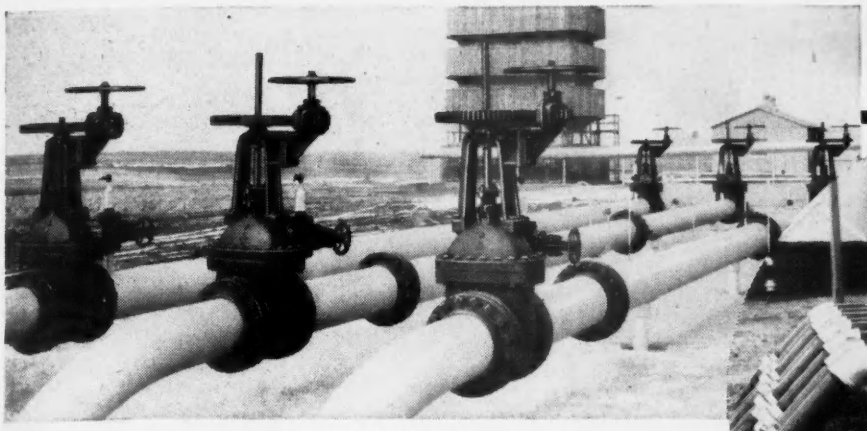


DR. R. E. WILSON
Vice President for Refining

L. S. WESCOAT
Treasurer

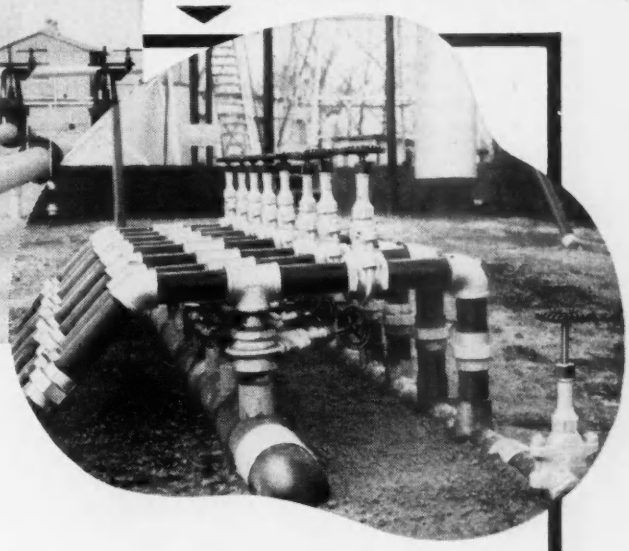


B. BREWSTER JENNINGS
Vice President for Transportation



HIGH PRESSURE *incoming gas lines with Crane 12-in. Ferrosteel gear-operated double disc gate valves.*

CENTRAL MANIFOLD *on field tank farm with all-Crane iron body clamp gate valves, malleable iron fittings, unions, and welded headers.*



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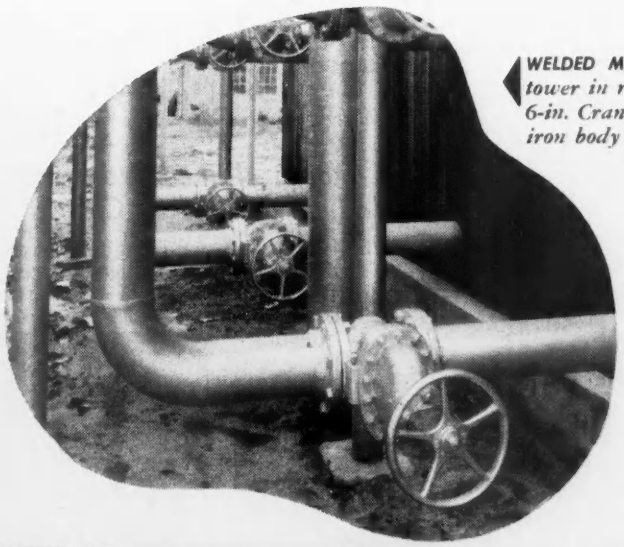
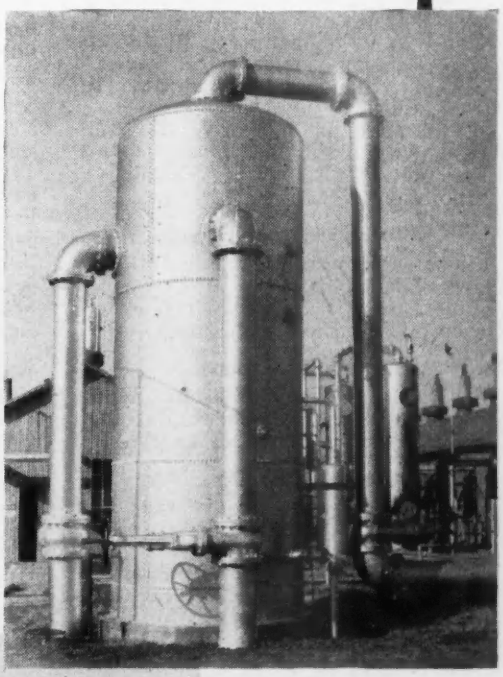


WELDED MANIFOLD *to cooling tower in recycling plant with 6-in. Crane No. 461 standard iron body wedge gate valves.*

FIELD GAS *scrubber unit featuring Crane 16-in. 125-lb. iron body gate valves, flanged fittings, and flanges.*



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Central United States: H. N. Greis, Deep Rock Oil Corporation, Tulsa; Jake L. Hamon, Cox & Hamon, Dallas; E. A. Landreth, Fort Worth; Henry L. Phillips, Sinclair Oil Corporation, New York; Ralph Pryor, Pryor & Lockhart, Wichita, Kansas; H. R. Straight, Cities Service Oil Company, Bartlesville, Okla.; R. L. Wheelock, Wheelock & Collins, Corsicana, Texas; H. C. Wiess, Humble Oil & Refining Company, Houston.

Eastern United States: George J. Hanks, South Penn Oil Company, Pittsburgh, Penn.

Refining Group

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Rocky Mountain: P. N. Fortin, Yale Refining Company, Billings, Mont.

Central United States: T. H. Barton, Lion Oil Company, El Dorado, Ark.; Alexander Fraser, Shell Oil Company, New York; D. J. Moran, Continental Oil Company, Houston.

Eastern United States: Robert H. Colley, The Atlantic Refining Company, Philadelphia; B. I. Graves, Tide Water Associated Oil Company, New York; W. S. S. Rodgers, The Texas Company, New York.

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Rocky Mountain: W. H. Ferguson, Continental Oil Company, Denver.

Central United States: Henry M. Dawes, The Pure Oil Company, Chicago; I. A. O'Shaughnessy, The Globe Oil & Refining Company, St. Paul; A. W. Peake, Standard Oil Company (Indiana), Chicago.

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Natural Gasoline Group

J. H. Dunn, president, Natural Gasoline Association of America; Shamrock Oil & Gas Company, Amarillo, Texas.

At-Large Group

John M. Crawford, Parkersburg Rig & Reel Company, Parkersburg, W. Va.; J. Frank Drake, Gulf Oil Corporation, Pittsburgh; George A. Hill, Jr., Houston Oil Company of Texas, Houston; A. Jacobsen, Amerada Petroleum Corporation, New York; John M. Lovejoy, Seaboard Oil Company of Delaware, New York; J. F. Lucey, Lucey Petroleum Company, Dallas; R. Ogarrio, The Texas Company, New York; J. Edgar Pew, Sun Oil Company, Philadelphia; Frank Phillips, Phillips Petroleum Company, Bartlesville, Okla.; E. B. Reeser, Tulsa; H. F. Sinclair, Sinclair Oil Corporation, New York; John R. Suman, Standard Oil Company (New Jersey), New York.

Henry Ford II, left, accepts on behalf of his grandfather, Henry Ford, the Gold Medal Award for Distinguished Service. The presentation is being made by William R. Boyd, Jr., Institute President.

At-Large Group (Elected by the Board)

John C. Case, Socony-Vacuum Oil Company, Inc., New York; Walter S. Hallanan, Plymouth Oil Company, Pittsburgh; William F. Humphrey, Tide Water Associated Oil Company, New York; W. Alton Jones, Cities Service Oil Company, New York; Harry T. Klein, The Texas Company, New York; Henry D. Moyle, Wasatch Oil Refining Company, Salt Lake City; T. Rieber, Barber Asphalt Company, New York; Sam Mosher, Signal Oil & Gas Company, Los Angeles.

Elected to Fill Unexpired Terms

A. A. Jergins, San Joaquin Valley Oil Producers Association, Los Angeles, to succeed Dana Hogan, deceased, on production group (Pacific Coast). Maston L. Nixon, Texas Mid-Continent Oil & Gas Association, Dallas, to succeed E. L. Smith, deceased, on production group (Central United States). Frank O. Prior, Standard Oil Company (Indiana), Chicago, to succeed A. W. Peake, resigned, on At-Large Group.

Dan Moran Named President Of Industry's 25-Year Club

Dan J. Moran, president of Continental Oil Company, was elected president of the 25-Year-Club of the Petroleum Industry at the annual meeting in Chicago last week.

Dan J. Moran

The five governors named for the ensuing year were R. G. A. Van der Woude, Shell Union Oil Corporation, for the Eastern area; Henry M. Dawes, The Pure Oil Company, for the North Central area; Robert W. McDowell, Mid-Continent Petroleum Corporation, for the Southern area; H. D. Clark, Standard Oil Company of California, for the West Coast area, and R. A. Wotowitch, at large.

Corrosion and Preventive Methods in the Katy Field

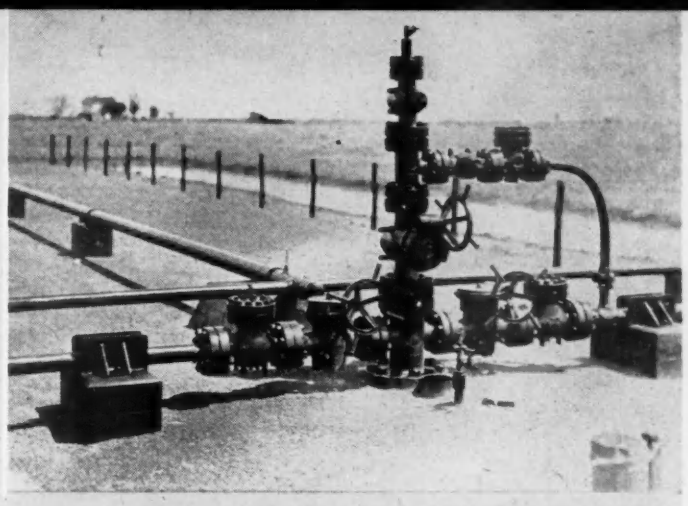

Figure 1 (below). Well-head assembly on a producing well.

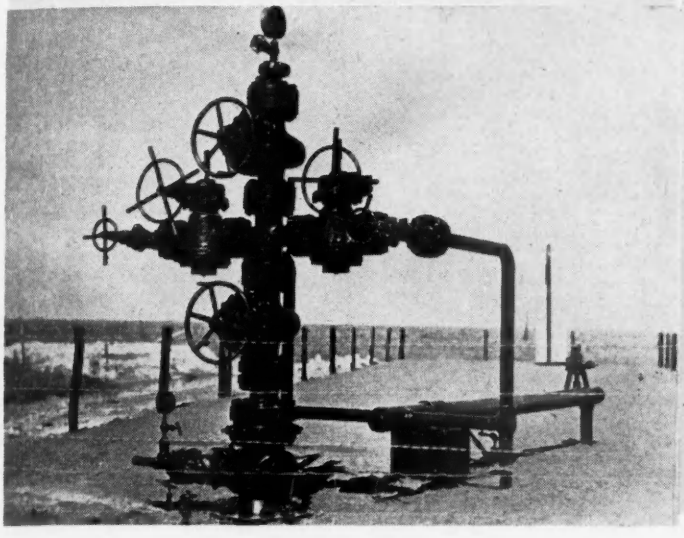

Figure 2 (above). Well-head assembly on an injection well.

By R. C. BUCHAN, Humble Oil & Refining Company, Houston

THE corrosion of equipment used in producing condensate reservoirs is becoming an old problem in the industry. Most of the present knowledge pertaining to the subject has been well summarized in the form of tentative conclusions in a recent API paper.[1] Intensive efforts are being continued on this problem by committees under the sponsorship of the American Petroleum Institute (API), Natural Gasoline Association of America (NGAA), and the National Association of Corrosion Engineers (NACE). Additional work is being done by the U. S. Bureau of Mines, and by the research and operating departments of the producing companies.

It is the purpose of this paper to present the specific problem encountered in one of the larger condensate fields, and to discuss the problem essentially from an operating viewpoint.

Long periods of research are in prospect. Because of the numerous unevaluated and possibly some unrecognized variables connected with the problem, and because of the apparent inconsistency of the observed phenomena, a major effort should be directed toward full-scale field experiments. This is being done in the Katy field; and, although all corrosion is not under control, a reasonably early solution of the problem in that field appears likely.

The Katy gas-condensate field, located in Waller, Harris, and Fort Bend counties about 30 miles northwest of Houston, is an oblong domal structure covering an area of approximately 30,000 acres. The average well depth is 7600 feet. The formation between 6250 and 7450 feet below sea level is divided into six separate sand reservoirs — each of which consists of one or more lenticular members. The porosity of the sands varies from 18 to 35 percent. Each reservoir has a definite water table, and producing wells are completed well above the gas-water contact.

The field was discovered in 1935, and developed rather slowly. A cycling plant was put into operation in January, 1943, and an absorption plant was added later in 1943. The entire field was unitized, and the plant was enlarged in 1944. The present major facilities in the field consist of 33 producing wells; 36 miles of gathering lines; an absorption-compressor plant; 34 miles of injection lines, and 13 injection wells. Almost all of the euqipment and materials selected are those suitable for working pressures encountered in a non-corrosive, non-abrasive service.

The producing wells were initially completed with

THE author describes briefly the Katy gas-condensate field, the producing and cycling equipment used, and its operation. The effects of acidic-water corrosion are illustrated and discussed. The use of plastic-coated pipe and the use of soda ash as a neutralizing agent are described as being practical means of reducing corrosion losses in the Katy Field. The need for continued research and for field testing of alloys is pointed out. Instead of waiting for a complete understanding of such problems, it is advocated that full-scale field tests be initiated as soon as corrosion is found in new fields. The arrangement of subsurface equipment to facilitate corrosion control is discussed briefly. The importance of keeping equipment in safe working condition is emphasized.

R. C. Buchan

(Presented before the Division of Production at the 26th annual meeting of the American Petroleum Institute, Stevens Hotel, Chicago, November 12, 1946.)

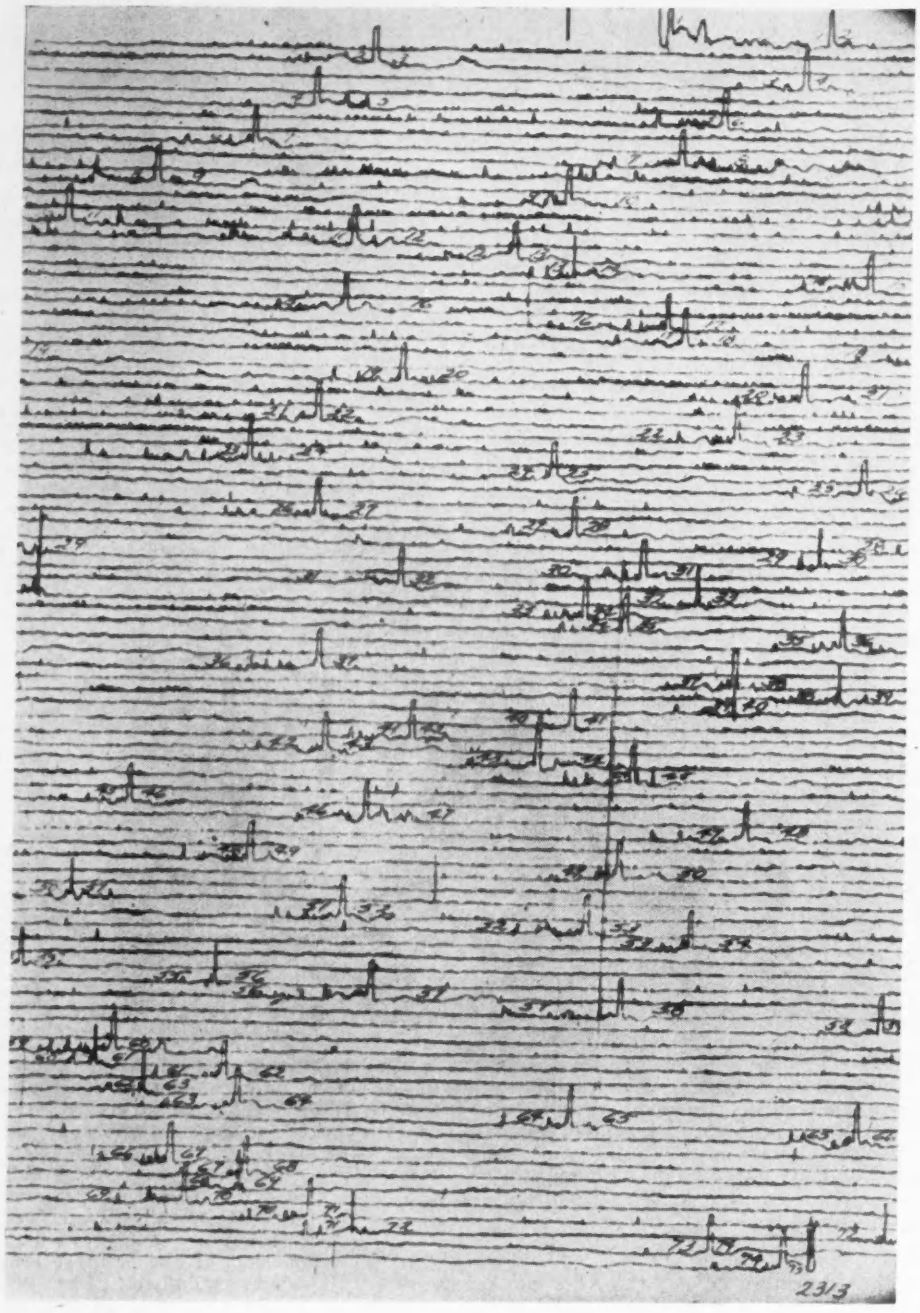

Figure 3. Chart from an internal caliper survey at Katy field in tubing used three years.

either seven-inch or 5½-inch-outside diameter oil-string casing and with 2½-inch or two-inch tubing, set without packers so that wells could be produced from both the casing and tubing. Surface casing, 10¾-inch- or 9⅝-inch-OD, was set at a depth of at least 2500 feet in all wells. Producing wells were equipped with 6000 pounds per square inch test well-head assemblies, which included adjustable chokes with one-inch-inside diameter beans on the tubing and casing outlets. Injection wells are equipped with tubing and with 10,000-psi test well-head assemblies. Figures 1 and 2 illustrate typical well-head assemblies.

The gathering system is of welded construction, and consists of nine main lines into which the individual well lines are connected, usually at right angles. The pipe size varies from four to ten inches, but most of it is eight-inch. Lines were tested to at least 3100 psi with water, after installation. The pipe sizes in the injection system vary from 4 to 12 inches and were tested to 4100 psi. No lines were doped and wrapped. Cathodic protection is not used except in the plant area to protect lines in the plant.

The absorption-compressor plant was designed for an absorber pressure of 1800 psi. The actual pressure used varies between 1800 and 1850 psi, and the lean gas is compressed to 3150 psi for injection.

Six-inch lines and meters are used at injection wells, and these are connected to three-inch or four-inch well-head fittings.

Operation of the Field

Until January, 1943, wells remained shut in, or were produced at low rates —mainly for fuel for drilling operations. From January, 1943, to April, 1946, wells were produced at fairly high rates through the casing and tubing. During this period the flowing well-head pressures were between 2400 and 2630 psi; producing rates were 2 to 36 MMCF (million cubic feet) per well per day (most were between 20 and 25 mmcf); and the well-head temperatures were between 144 and 180° F. (most were between 170 and 175° F.).

During April, 1946, all production through the casing was discontinued, and work was accelerated to replace some of the corroded two-inch and 2½-inch tubing with larger diameter tubing, in order to obtain the desired flow capacities without having to reduce the absorber pressure at the plant. Most of the new tubing installed was 4½-inch-OD (four-inch-ID) or four-inch-OD (3½-inch-ID), externally upset with an insert joint to form an internally flush bore. The present flowing well head pressures are between 2100 and 2250 psi; producing rates are 7 to 32 mmcf per well per day (most are between ten and 15 mmcf); and the well-head temperatures are between 148 and 170° F. (most are between 150 and 160° F.).

The inlet pressure at the plant varies between 2000 and 2100 psi. The temperature of the gas entering the plant varies between 130 and 140° F.

The gas is injected at a well-head pressure of about 3025 psi, and at rates of 7 to 61 mmcf per well per day (most wells take 20 to 30 mmcf per day). The well-head temperatures at injection wells vary from 100 to 155° F, and average 145° F. The average temperature of the gas leaving the plant is 160° F.

Equipment Affected by Corrosion

Corrosion affects to some extent all casing and tubing strings subjected to well fluids. The ferrous surface equipment, including well-head assemblies, meter runs, and the gathering system, are corroding internally. Corrosion in the plant has been negligible; and, although conditions warrant periodic inspections, corrosion is a minor problem at present, and it is believed that it will not become serious. The casing is believed to be corroding externally as a result of battery currents between the casing and flow lines.

The corrosion of subsurface equipment is the most expensive part of the overall problem. Analyses of waters produced in 1943 indicated that corrosion was occurring in the wells, but the seriousness was not fully realized. During the past 12 months, 12 strings of tubing were pulled after an average service of 3½ years, and only about 25 percent was in usable condition to reinstall. Grade H-40 and J-55 externally upset, non-normalized API tubing was installed initially. Except for the removal of mill scale, the lower part of the strings has not been attacked by corrosion. The internal corrosion in the remainder of the strings does not follow any given pattern, except that usually the first two feet of the lower end of each joint corrode more rapidly and more severely than does the upper end or the middle of the joint. Figure 3 shows the results of an internal caliper survey, which reflects the condition of tubing after three years of average Katy service. Complete inspections of the tubing removed from five wells show that no pitting has occurred in the main body of the pipe to within two feet from the ends in three of the five strings, even though pits have penetrated more than 50 percent of the wall in the upset and upset round-out areas. External corrosion of tubing in wells producing from both casing and tubing has been minor, except that couplings, as shown in Figure 4 are usually pitted—some badly—

Figure 4. Corroded tubing coupling.

Figure 5. Corroded 5½-inch liner.

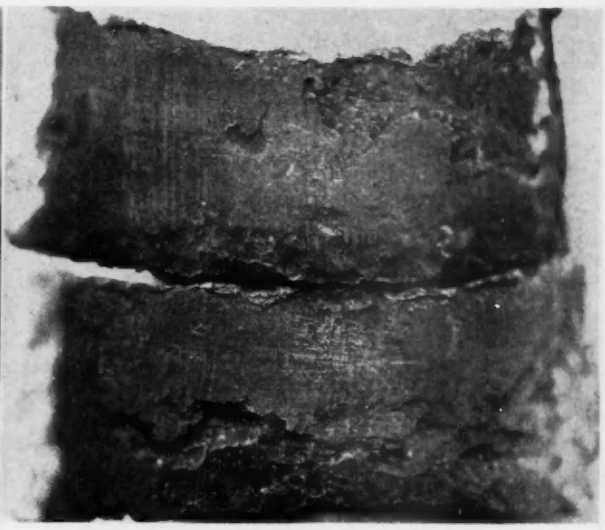

Figure 6. Internal corrosion of casing.

and the exposed threads are attacked where water can stand. Mill scale appears to be completely removed in less than one year.

Little is known concerning the actual condition of casing in Katy wells. One string of 5½-inch-OD full-length liner was pulled after having been in service 3.7 years. The lower half of this pipe was not visibly affected. Internal corrosion was found in the upper half, and the pitted condition resembled that occurring on the inside of tubing. Most of the pitting was concentrated in an area within 24 inches of the end of the down end of the joint. The top 1200 feet of this string was severely corroded. A number of holes were present in the end of the joints in the threaded section, and approximately ½-inch of the ends of several joints had corroded away as illustrated in Figure 5. No external corrosion was found on this pipe, because it had been set inside of a 9⅝-inch-OD string that extended to about 7000 feet. (The external corrosion apparent in Figure 5 was due to atmospheric corrosion subsequent to removal from the well.)

Internal casing corrosion in the form of pitting has been found in other wells when well-head equipment changes were made. Figure 6 shows the condition of a piece of casing removed from just below the well head. Suitable tools for determining the extent of internal casing corrosion have not been available. Several recently developed tools will probably be tried at Katy as soon as the tools are available.

Corrosion and subsequent leakage made it necessary to replace almost every wing valve installed initially in well heads on producing wells—some after less than two years' service. The throats and flange facings are most seriously attacked. The design of these valves needs no improvement, but corrosion-resistant materials are needed. Valves lined with several types of stainless steels or with hard-facing material have given perfect service with no apparent corrosion after more than two years' use. Some of the other alloys used for lining appear to be no more resistant than the ordinarily used steels. The shortage of valves known to be satisfactory in this service has dictated the use of 10,000-psi test valves to obtain the added corrosion tolerance.

Parts of choke assemblies used on producing wells are frequently replaced. Corrosion and erosion of the stems and beans prevent a tight closure, usually after about 30 days. Stems and beans are replaced every five or six months, because after that time their condition is such that they cease to serve their intended purpose. Hard surfaces, such as are obtained by lining with hard-facing material and hard electroplated chromium, have been proved to resist this erosion. Because only parts of the surface need protection against erosion, and because such linings are difficult to apply to the entire assembly, the base metal needs to be a corrosion-resistant material.

Other parts of well-head assemblies are corroding. Figure 7 illustrates the nature of corrosion on ring-joint flanges. Because of general present lack of any proven material that is not too expensive, the present program includes the use of 10,000-psi test equipment which provides additional corrosion tolerance. Plastic coatings are being tested in a number of wells; and, although a few of these coatings look promising, the cost of properly coated fittings is about the same as the cost of satisfactory alloys should be.

One of the more serious problems at Katy from a safety viewpoint is corrosion of ring gaskets. Figure 8 shows a ring that had remained in service about two years. Synthetic-rubber "protection" rings are used to keep well fluids from having easy access to the ring gaskets. The rubber rings deteriorate and often disappear in three to four months, and the exposed ring gaskets corrode to an alarming degree in one year's time or less. So far, minor leakage has indicated failure, and replacements are made. Also, periodic inspections are made, and all rings that have been attacked are replaced. A program to try to find a better "protection" ring is in effect. Some of the available plastic materials appear suitable.

Katy is one of the six or seven fields in which a number of alloys are being tested by the NACE condensate well-corrosion committee. These tests should result in giving the industry a better selection of materials for combating corrosion in well-head assemblies.

The corrosion that has been experienced in the gathering system has been confined to the inside bottom of lines, as shown in Figure 9, except that, at tieins of individual well lines, erosion has aggravated corrosion as is shown in Figure 10. Some parts of individual well lines have been replaced, and others probably will have to be replaced in the next year. Heavier pipe is being used for replacements. Test holes are used as an indication of loss of wall thickness. These holes have been drilled at all points where visual inspections have shown that a tendency toward corrosion exists. The holes are 1/16-inch in diameter, and drilled deep enough that a calculated safety factor of 1.15, based on minimum yield, still exists when corrosion allows the gas to break through the test hole. Radium inspection of critical locations in lines is also used to a limited extent. This has proved to be a satisfactory non-destructive spot-inspection method, provided two measurements 90 degrees apart are made at each location so as to detect non-concentric pipe, and provided the individual method is accurate if an unknown amount of liquid is present. No external corrosion is experienced.

Corrosion in the gathering system is minimized by the chemicals used to protect subsurface equipment. The reduction in pressure and temperature over that existing a year ago may alter the rate of corrosion. The safety factor for bursting strength has been increased by the reduction of pressure.

No corrosion has as yet been found in the injection lines or injection-well equipment. This is as would be expected, because the gas contains 50 percent or less water than the amount necessary for saturation entering the average injection wells. One injection well has a well-head temperature of about 100° F., and no corrosion is being experienced—indicating an unsaturated condition at this lower temperature.

The Cause of Corrosion

The internal corrosion of ferrous equipment at Katy is due to the acidic properties of the condensed water under the existing pressure and temperature conditions, as was pointed out by several investigators.[2,3,4] Carbon dioxide and organic acids are present. No doubt, other substances are present, some of which probably increase, whereas some decrease, the corrosion rate; but the effect of no single substance has been isolated. The produced gas contains 0.6 to 0.7 percent carbon dioxide. The con-

Figure 7. Corroded ring-joint flange.

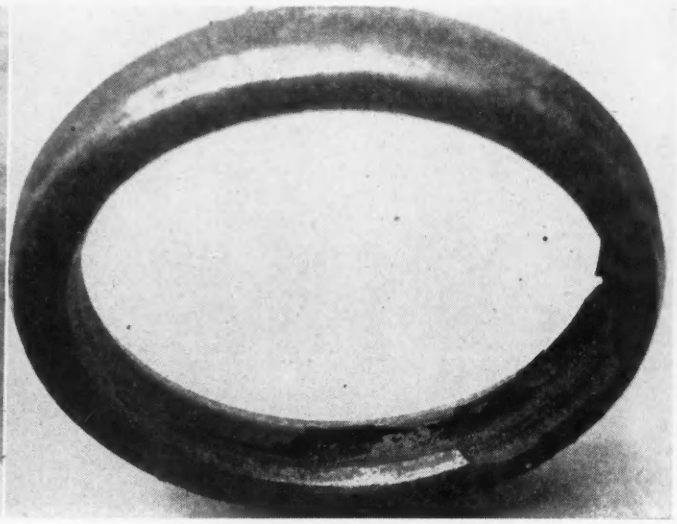

Figure 8. Corroded ring gasket.

densed water at the plant inlet contains 390 to 400 parts per million of organic acids (as propionic acid), and about 150 ppm of iron. The pH of the water in the tubing has not been measured because of physical difficulties, but it is believed to be about four.

Thorough studies of data from individual wells have not resulted in determining the effect of the several variables involved. The iron content of waters taken at individual wells varies considerably, i.e., from 70 to more than 400 ppm; and, in general, the iron content appears to be lower in many wells at high rates of flow than at low rates. All evidence to date indicates that no iron or not more than a trace of iron is produced from the formation. Only one well in the field is producing more than a trace of salt water, and it has been under specific observation only a short while. The organic-acid content is fairly constant. No rate of production in any well has eliminated internal corrosion of tubing.

Effects of Erosion

Erosion is minor in the Katy field in comparison with corrosion. The term *erosion*, as used in this paper, includes impingement and any cavitational effects. In choke assemblies, erosion and corrosion are equally important, and freqent replacements are required. Plastic coatings are gradually removed by erosion in choke assemblies in one to two months in the average well. Erosion is a problem in only a few spots in the gathering system. The fact that erosion is a minor problem was proved by a study using metal coupons, including one made of 14-K gold, and by visual and radium inspections. Erosion does occur in piping at points of abrupt change of direction in the gathering system, particularly where lateral lines connect into main lines at right angles. The localization of corrosion on the inside of API tubing to near the down end of the joints could in a sense be connected with erosion; but is thought to be due to a reflux action or an unsteady liquid-film flow, brought about by turbulence at the couplings.

Stray Electric Currents

A rather thorough survey was made of the flow of electric currents in the field. The magnitude and direction of flow in the gathering system was determined, and surveys were made inside of the oil-string casing in a number of wells.

It was found that an average of 1.9 amperes (varied between 0.38 and 3.65 amperes) was flowing into all producing wells, and that an average of 2.9 amperes (varied from 0.89 to 4.96 amperes) was flowing into injection wells. The difference in electric potential was measured between the top of the casing and various points in the casing in several wells. This potential varied from 0 at the surface to about 30 millivolts at 7000 feet with the flow line connected, and 0 to 10 millivolts when disconnected. The current leaves the casing from top to bottom, bu a change of slope occurring in the average survey curve indicates that more than the average amount of current leaves at a depth of 3000 to 3500 feet.

These currents are believed to have no effect on internal corrosion; however, insulating flanges are to be installed to minimize external casing corrosion.

The Use of Chemicals to Control Corrosion

Often corrosion can be effectively controlled by chemical means,[5] and this is believed to be true in the case of internal corrosion at Katy. However, at the time that it was decided to try chemical control, conditions in the field made such a procedure undesirable, if not impractical, in many wells—mainly because tubing packers had not been installed. It was believed that the producing capacity of the formation would be reduced by some of the chemicals that might be tried, or by their reaction products.

To make chemical control feasible, it is necessary that: (1), a compound having suitable chemical and physical properties be available; (2), the mechanical arrangement of the equipment be such that chemical can be injected where needed with a minimum amount of trouble; and, (3), suitable injecting devices be available.

A research program has been in effect, and is being continued, in a rather intensive manner to evaluate chemicals for this purpose. Such work includes the correlation of laboratory-test results with results obtained in field trials. This program has not advanced to a satisfactory solution of the whole present problem, but it has indicated several approaches that can be used toward solution.

Laboratory tests indicated that two chemicals of the inhibitor type, viz., (1), bone oil; and (2), carbon disulfide, warranted extensive field trials in wells not equipped with tubing packers. Field trials showed that the bone oil is 50 to 75 percent effective as an inhibitor, but its use had to be condemned because of the odor imparted to the liquid products at the plant. The carbon disulfide was found to be only 15 to 25 percent effective, but it does not seriously affect the plant product. The low order of effectiveness, and the possibility that the iron sulfide scale which forms may prove objectionable in time, condemn the use of carbon disulfide. Other inhibitors are to be tested in wells without packers, but it still appears difficult to find a compound that is economical and has no undesirable characteristics.

Laboratory tests and use in other fields indicated that small amounts of neutralizing agents, such as sodium carbonate, sodium hydroxide, and ammonium hydroxide, would effectively reduce corrosion at Katy if properly injected. Soda ash was chosen, because it was easiest and safest to handle, for trial in several wells in which tubing packers were set, and tubing was perforated above the packer to allow egress of the chemical from the annulus to the tubing. After using solutions of soda ash for 90 days in several wells, it is thought that its use may prove to be an economic solution to the corrosion problem at Katy. Corrosion is being controlled with soda ash in eight wells at present (two wells have no packers). One pound of soda ash is dissolved per gallon of water, and is injected continuously into the casing at a rate of one gallon of solution per 1 to 3 mmcf of gas per day. The pH of the treated water produced is in the range of 7.0 to 7.8, and it is believed that the pH of the water in the tubing is 6.0 to 6.5. The iron content of the water varies from 10 ppm to a trace, indicating 90 percent or more effectiveness. No operating difficulties have developed as yet from the use of soda ash.

Chemicals useful in one field may not be useful in another. The converse is also true. Chemicals that are applicable in wells producing little or no salt water may have to be discontinued when salt-water production increases.

Any chemical injection in this work should be continuous rather than inter-

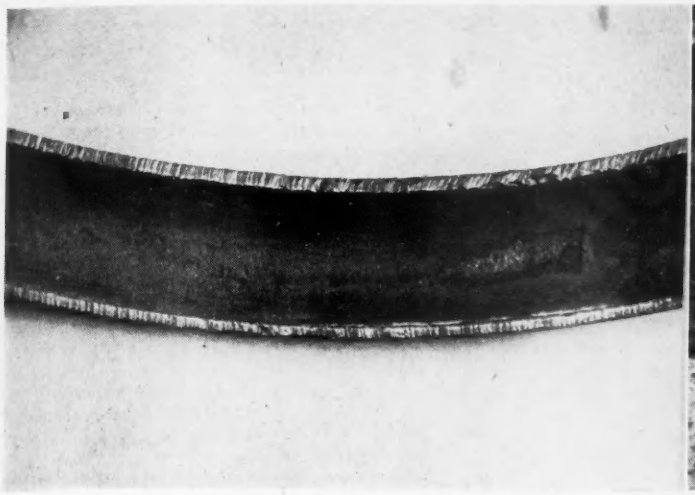

Figure 9. Corroded pipe in gathering system.

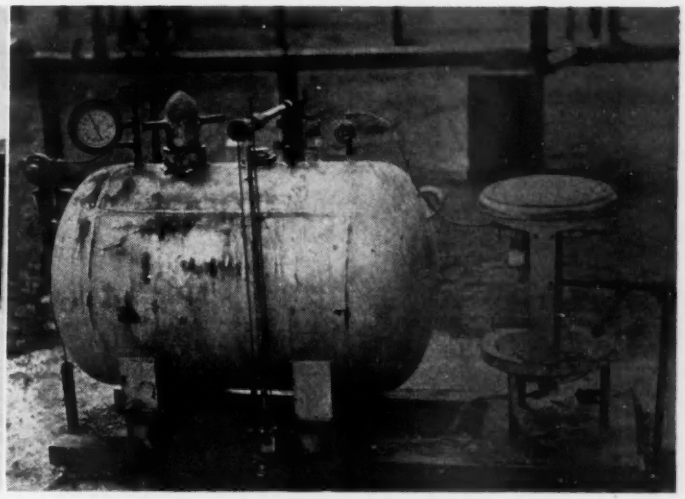

Figure 11. Gas-driven chemical pump.

mittent, and this has been proved at Katy. Gas-driven chemical injectors of the type commonly used in the oil fields often function erratically when injection pressures are above 2000 psi. Figure 11 illustrates one type of newly designed pump which operates well, but further improvement in these devices appears desirable.

The Use of Plastic Coatings to Prevent Corrosion

Four strings of tubing lined with a baked-on plastic coating were installed at Katy during August and September of 1946 as replacements for corroded tubing. Tubing was packed off near the bottom, and mud was left in the annulus. The plastic used is that referred to as the "Type 2" in the following discussion. At the time this paper was written these wells had not cleaned themselves completely of drilling mud and water, and the water analyses were considered as not being indicative of lack or presence of corrosion.

The "Type 2" coating was tried in well-head and other fittings in the Katy field. Inspection after five months revealed a new condition, except in choke assemblies, where it was gradually removed by erosion in two to four months.

Previous work in other fields led to the trial of coatings at Katy, and it is briefly summarized herein because of probable interest.

Experiments endeavoring to perfect plastic coatings for oil-well tubing service have been carried on intensively for at least five years, but until about 18 months ago no reasonably acceptable product was marketed. All but a few of the available products were readily condemned by laboratory experiments. Most of the earlier field tests of promising coatings were made in corrosive pumping wells, but in 1945 tubing coated with baked-on, thermo-reacting, and thermo-setting plastics was installed in a number of flowing oil wells. Seven strings of coated tubing using two different coatings were installed in 11,000-foot oil wells in a Louisiana field where tubing failed in three to four years due to corrosion. The temperatures, pressures, and corrosive conditions encountered in these wells are similar to the conditions in condensate wells in the Gulf Coast region. Figure 12 shows the condition of coated and of bare tubing in these wells, as reflected by internal caliper surveys. The charters taken in these wells are not entirely comparable because of the difference in the length of time that the tubing was in service, but corrosion of bare tubing in this field begins immediately after production starts, and the Type 1 plastic was known to have begun to fail—by flaking off—after it had been in service only three months. The pitting revealed in the tubing coated with the Type 1 plastic is believed to have started eight to ten months after installation. The survey of the tubing coated with the Type 2 coating reveals no corrosion. Type 2 coating has a phenol-formaldehyde base, is baked-on at approximately 350° F., and is applied in several layers to a total thickness of 0.005 to 0.006 inch.

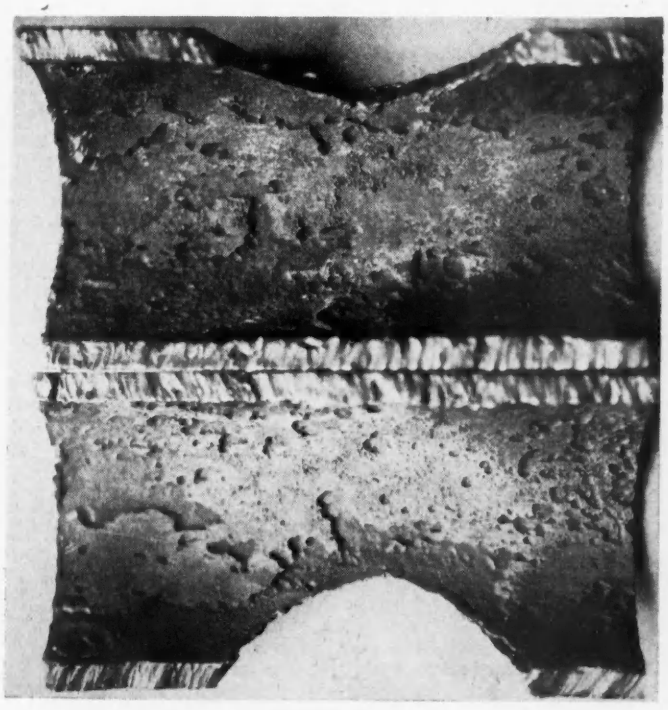

Figure 10. Aggravated corrosion at tieins in gathering system.

Arrangement of Subsurface Equipment to Facilitate Corrosion Control

Experience in the Katy and other fields[1] indicates that operators should expect corrosion in condensate wells having pressures above about 1500 psi and reservoir temperatures above 160° F. if the gas contains carbon dioxide in excess of 0.2 percent by volume.[6] Previous attempts to classify wells have indicated that possibly 25 to 50 percent of the wells in this class will encounter little or no corrosion. Present indications are that non-corrosive wells in this class are rare, and it is probable that 90 percent are corrosive. In view of this, serious consideration should be given to completing initially and equipping wells so that control of corrosion is facilitated.

At Katy all of the initial completions consisted of setting tubing, without packers, inside of perforated casing. This conventional method is ideal for obtaining maximum producing capacities from tubing and casing outlets, but corrosion can attack the inside of the casing and both sides of the tubing. Chemical for corrosion control can be injected either into the tubing or casing while production is from the other outlet. Such a control depends on a perfect chemical, i.e., one that has suitable chemical and physical properties, and particularly one that will not lead to plugging of equipment or the producing formation. No highly effective chemical for this purpose has been found. As a safety precaution against otherwise undetected casing leaks, a temperature-survey program is in effect to find leaks if and when they develop.

A number of wells at Katy have been reset with tubing as large as the casing size allows. This permits: first, higher rates of production without large pressure losses; and, second, the injection of chemicals into the casing. A tubing packer is installed near the bottom to prevent chemical from going to the formation. Chemical goes through per-

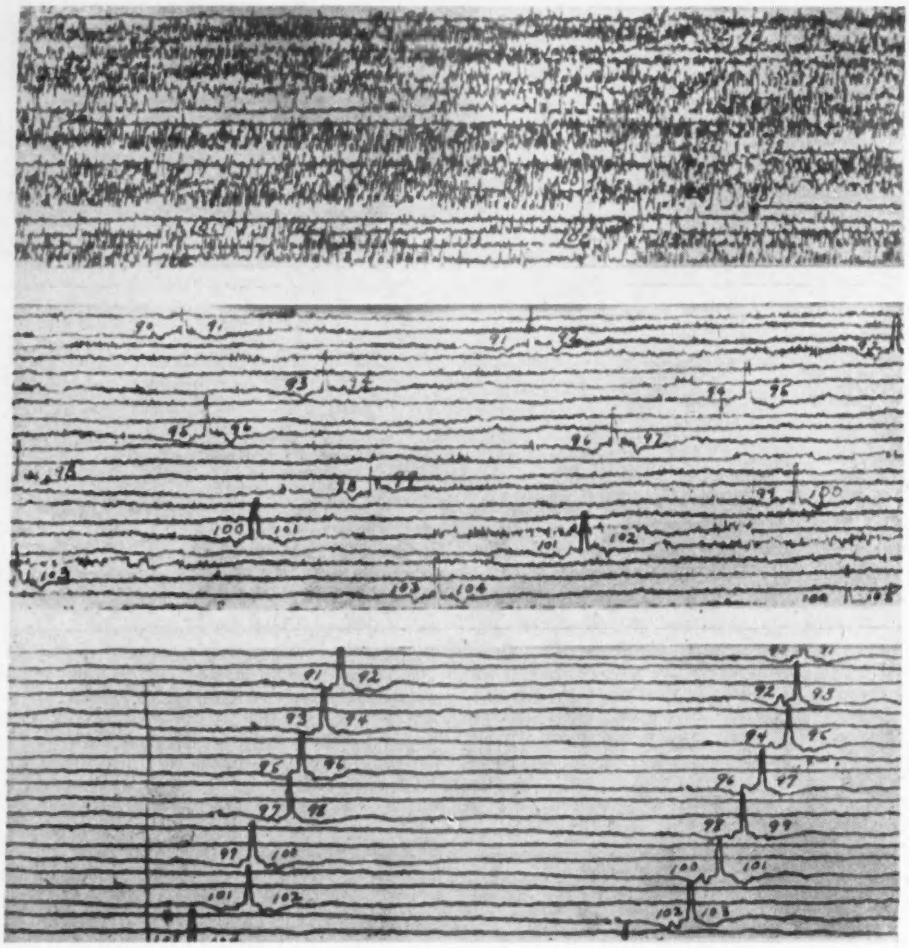

Figure 12. Charts from internal caliper surveys in three oil wells, indicating the condition of bare and plastic-coated pipe.
Top: bare pipe. Middle: Type 1 plastic has failed. Bottom. Type 2 plastic staying intact.

forations installed in the tubing just above the packer. With this arrangement, the inside of the casing and the outside of the tubing are subjected to a minimum of corrosion. The principal disadvantage—as is also true when no tubing packer is used—is that, if the casing leaks due to any cause, a loss of reserves or even a wild well could result.

Tubing packers were used in the four wells that were equipped with steel tubing coated internally with plastic, and the annulus was filled with drilling mud weighing approximately ten pounds per gallon. The economic success of this system, of course, depends on the life of the plastic coating, but almost complete protection against serious casing failures is obtained. If at some later time chemical has to be injected, the tubing can be perforated in place, and injection can be started, or some other means of injecting chemical might be tried.

Another system that has been considered, but has not been used at Katy, utilizes two strings of pipe installed concentrically inside the oil-string casing, complete with suitable packers. Mud would be left between the casing and the intermediate string, and chemical could be injected either into the innermost or the intermediate string while production is taken from the other. Such settings give the maximum protection against casing failures, but cost more. A rather effective inhibitor is necessary to justify the expense of the two large-diameter strings if the innermost string is used for the production tubing. If the intermediate string is as large as possible and is used as the production string, and if chemical is injected by means of a macaroni string, the hazard of fishing jobs for parted macaroni strings is a disadvantage.

In the foregoing discussion it is assumed that all tubular goods are ferrous material. All types of materials have been considered for tubing service in condensate wells, and, with the exception of plastic-coated steel, no material appears to be economical—and this means glass linings, metallic linings and coatings, and alloys having adequate physical and chemical properties. Steel coated with the present semi-proven plastics costs approximately twice as much as uncoated steel. In cases when tubing fails in three to four years, such coatings can be justified if they extend the life of tubing only one year, because the cost of the replaced tubing is usually 25 to 30 percent of the cost of the workover. The overall economics involved, insofar as tubing corrosion is concerned, is that a material costing approximately five times that of mild steels can often be justified if it will give trouble-free service for ten to twelve years.

Economic Aspects of Corrosion Control

The estimated average annual loss due to corrosion in the Katy field is $200,000. About 75 percent of this is for the periodic replacement of tubing, whereas the remainder is for inspecting and replacing other equipment. This estimate assumes that the casing has not been damaged sufficiently to cause early casing failures. The corrosion losses estimated previously herein would become secondary if one or more wells were to blow out and result in wild wells and loss of reserves. Also, if only a tubing-replacement program is followed in the future, i.e., no corrosion prevention is practiced—the damage resulting from frequent reworking of wells would increase the annual losses by such things as bad luck with fishing jobs, further damage to casing, and possible damage to the formation by mud and water.

Plastic coatings are not a proven product, but success to date indicates that they deserve careful consideration. At Katy, for example, all of the tubing in producing wells can be coated for about $140,000, or about the same amount as the estimated average annual workover expense due to tubing corrosion. Should the coatings extend the life of tubing only one year, they will pay out in comparison with using bare tubing and no corrosion protection. If plastic coatings will extend the average life of tubing five years, the use of coated pipe will probably prove to be the most satisfactory method of handling the subsurface problem. It would not solve the corrosion problem in entire well-head assemblies because of erosion in choke assemblies, nor does it eliminate the need for probable chemical protection in the gathering system. The best advantage that plastic-coated tubing has to offer is that the tubing can be packed off to obtain protection against casing failures while a reasonable protection against corrosion is obtained. The monetary value of this safety precaution is difficult to estimate at the present time.

The successful use to date of soda ash as a neutralizing agent makes it appear to be a practical solution to most of the problems in this field. The relatively small amount of neutralizing agent required could not have been predicted from laboratory tests two years ago. It is estimated that soda ash, when used in all wells, will reduce the average annual corrosion expense to about $50,000. Its principal disadvantages are: first, the need for constant attention and checking; and, second, the fact that either the casing or an additional string of tubing is needed to convey chemical to the lower part of the tubing. The chemical itself will cost about $8000, whereas the remainder is chargeable to (1), expense of applying; (2), checking results obtained; and (3), losses not prevented. Some type of chemical treatment appears desirable in the gathering system, and the soda ash injected for subsurface protection also fills this need.

Other more expensive chemicals may prove as economical as soda ash—particularly if they are found and applied in those wells that at present are scheduled for workover jobs so as to postpone or eliminate those workovers.

The amount of future corrosion losses cannot be estimated too accurately because of lack of complete knowledge of the condition of casing in the wells, and because the change to the program of producing only through the tubing will alter the corrosion rate in the tubing, well heads, and gathering system. It is believed that some casing failures will occur in the next few years. This will require the installation of liners in affected wells, and will result in reduced flow capacities. Some additional wells will be required, the cost of which will be chargeable to corrosion. The higher rate of flow through tubing will probably

■ CONTINUED ON PAGE 40

UTILIZATION OF *Old* WELLS

By W. A. HEATH, Earlougher Engineering, Tulsa

THIS article discusses the historical background of the utility and adaptation of old wells in a secondary-recovery program.

The prime advantage of using old wells is a large saving in development cost. Disadvantages consist of irregular spacing, poor mechanical condition of the well bore, exposed gas, or thief formations which may be difficult to isolate because of having been shot with nitroglycerin.

W. A. Heath

Deposition of paraffin and other residues in the well bore is troublesome in certain areas—particularly the eastern district; and, if not removed prior to conversion of an old well to an input well, it may greatly reduce the efficiency of the driving medium. Methods and suggestions for removing the paraffin are given. In the Mid-Continent district little difficulty is encountered in deposition of residues, and no special precaution other than a mechanical cleanout is performed in conversion of a well to input. In some instances precipitation of calcium, barium, or strontium salts on the sand face has occurred, and special treatment is required.

Reasons for intensive secondary-recovery development as practiced in certain areas are discussed.

(Presented before the Division of Production at the 26th annual meeting of The American Petroleum Institute, Stevens Hotel, Chicago, November 12, 1946.)

OPERATORS have been concerned with the problem of adapting old wells for use in secondary-recovery projects since the initial applications of the process in the early years of the 20th century. The purpose of this paper is to present a summary of past practices in employing old wells in secondary-recovery projects, difficulties encountered, methods of reconditioning, and the reasons for drilling new wells in certain areas.

History of Old-Well Usage

Water Flooding: The early history of water flooding in the Bradford, Penn., area, birthplace of the process, is somewhat obscure—due, perhaps, to the fact that the practice was not publicized prior to its legalization by state law in 1921. Original flooding effects were probably achieved through the medium of ground waters entering the sand in old wells which were standing idle with the casing leaking, or else abandoned without the sand having been properly plugged off. This may have been accidental or deliberate, as Carll,[1] in 1880, directed attention to the beneficial effects of water encroachment in production of oil. The earliest recorded floods were accomplished by the practice of pulling or ripping the casing (termed "dumping") in a well or wells, generally near the center of the lease, to create the pattern arrangement termed the "circle" flood. As the old wells, drilled about 1880, were irregularly spaced on the lease at a density of approximately five acres per well, a considerable length of time was necessary for the drive to be effective; for, according to Umpleby,[2] the horizontal rate of travel of hydrostatic-head drives averaged only 50 feet per year. This led to the practice of drilling new wells in a circle around the "dumped" well to obtain quicker effects of the water drive. In subsequent development of the "line drive" and "five-spot" patterns of flooding on close spacing (one to 1½ acres per well), the old wells rarely fitted into the pattern arrangement to permit their use in lieu of drilling new wells. In the early pattern floods, the old wells were allowed to produce, regardless of their location in the pattern, until flooded out by the encroaching water. Fettke[3] states: "It was discovered early that many old wells did not give the results obtained from new ones, either when used as producers or as intakes—the reason undoubtedly being that, as the oil approaches a producing well, due to release of pressure, paraffin tends to separate out and partly close the pores of the sand for a short distance back from the walls of the well. It is doubtful, therefore, whether wells that have been used as oil producers for three or four years make quite as satisfactory water intakes as wells expressly drilled for that purpose."

Development of the practice of delaying the drilling of the oil wells in a "five-spot" development program until the oil became "banked" around the oil-well locations necessitated the plugging of all old wells to prevent a release of reservoir pressure that would defeat the purpose of the practice.[4]

For many years it has been common practice among most of the Bradford operators to abandon all old wells prior to flooding. One of the principal reasons for this procedure is the belief that their use might prevent the concentric "banking" of oil in the five-spot pattern and result in inefficiency.

Inaccurate sand records may have been responsible in part for the poor results obtained through use of old wells in this pool. A recent development making use of reconditioned and reshot wells, in which the sand was accurately located by electric-log surveys, reports results comparable with newly drilled wells.

In West Virginia, a water flood was commenced in the Cabin Creek Pool[5] in 1936, using old wells both for input and producing wells with apparently little difficulty. The location of the old wells was such that a seven-spot pattern could be formed.

Floods were reported in progress in the Mid-Continent region as early as 1916 in Chautauqua County, Kansas.[6] These were usually dump floods of the "circle" or "line-drive" type making use of existing wells. Production increases were not phenomenal due to use of hydrostatic head only, but were sufficiently satisfactory to continue the process.

Old wells were used in the initial flooding attempt in the Nowata pool, Oklahoma, in 1931.[6] Results were disappointing, and the poor showing was thought due to use of the old wells. Subsequent floods in the same area utilizing newly drilled wells did not achieve appreciably greater measure of success. Most of the early systematic Mid-Continent floods in the shallow Bartlesville sand pools of northeastern Oklahoma and Southeastern Kansas adhered strictly to pattern development, and made use of old producing wells only when they were reasonably close to the pattern location. As development progressed, every possible effort was made to use the old wells as producing wells. Rigid adherence to exact geometric pattern was recognized as not being an absolute necessity; for, although uniform injection volumes on a sand-thick-

ness basis was considered desirable for unform floodout, such practice was seldom possible due to variable permeability capacities of the injection wells. Any attempt to achieve such uniformity by regulating all wells to the same injection rates as the small-capacity wells would unduly prolong the rate of floodout and return on investment. Thus, it was considered that, as uniform floodout was not being achieved by geometric pattern, the pattern could be shifted, whenever necessary, to use the old wells.

In the 2000- to 2700-foot Bartlesville "shoestring-pools" sand of Eastern Kansas, the initial flood[8] used the old wells drilled on ten-acre spacing as producers, with injection wells newly drilled at five-spot locations. The next flood in this area utilized the old wells, drilled on six-acre irregular spacing, both for producing and injection wells, with only two new injection wells drilled. No difficulties other than repair of casing leaks and cementing of casing seats were encountered. The success of this project has led to installation of five other projects using old wells almost exclusively for both inputs and producers. As the old wells are generally on regular ten-acre locations, injection-well spacing in conversion of alternate wells to input is one well to 20 acres. Such wide spacing is feasible in comparison to the close spacing at Bradford, due mainly to higher permeability of the sand and greater depth. The greater depth permits application of higher injection pressures, if necessary. Pressures in excess of 1500 pounds per square inch at the sand have not, as yet, been used. Had the permeability been higher at Bradford and wells regularly spaced, it is probable that a larger percentage of the old wells would have been worked into the development program.

Gas and Air Repressuring

Gas and air repressuring have been more general in application than water flooding. An attempt at gas or air injection at sometime or other has been made in practically all of the older oil-producing areas. Following the first commercial application of the process near Chesterhill, Ohio,[7] its development spread rapidly to Pennsylvania, West Virginia, Kansas, and Oklahoma. In the original projects old wells were used for injection, with little attempt to effect pattern arrangement. Results were generally good—even considering that the poorest wells, mechanically or productivity, were often selected for input wells.

The drilling of new wells for air- or gas-injection purposes started about 1927, with intensive pattern development commencing about 1932. In the Mid-Continent the most intensive pattern development is a 750-acre area in the 600-foot Bartlesville sand of the Childers pool, Nowata County, Oklahoma. This was developed with a density of five acres per input well, and 2½ acres per producing well, with approximately two-thirds of the wells being newly drilled. The advent of water flooding in the shallow area limited the expansion of intensive air- and gas-repressuring activity.

Pattern development is quite a common practice in the Venango district of Pennsylvania,[8] where depth of the sand is less than 800 feet, with new wells being drilled for intake wells. Intensive developments have been more recently installed on uniform "seven-spot" patterns, with the drilling of both new input and output wells on spacing patterns ranging from 150 to 250 feet (0.67 to 1.85 acres per oil well, and 1.34 to 3.70 acres per input well). In injection wells the sand is cored and analyzed for permeability, porosity, oil and water content. If permeabilities show wide variation stratigraphically, the sand is segregated by placement of packers in order that the injection medium can be allocated uniformly to the sections of varying permeability. As many as five packers have been used in a single well.[9]

In Kentucky,[10] systematic spacing and pattern arrangement for repressuring is practiced in several pools—notably those producing from the "Corniferous" formation at about 1100 feet in depth. This formation consists of three pay zones of varying permeability, which require separation by packers for selective injection in order adequately to repressure all three pays in the same injection well.

In West Virginia,[11] old wells are used practically exclusively in repressuring activities. Depth of the sand in repressured pools averages 2000 feet. The original wells were not drilled on regular spacing, thus making it impossible to achieve uniformly spaced pattern arrangements for repressuring.

In the Mid-Continent pools exceeding 1500 feet in depth, where the old wells were drilled on regular ten-acre spacing, such wells are generally used for both input and producer on some type of pattern arrangement. One injection well serves from three to seven producing wells. Operators using wider spacing of input wells generally follow the policy of injecting larger volumes into each input well than those employing closer spacing.[12]

Gas-injection operations in Ohio, Illinois, Louisiana, Texas, and the Rocky Mountain states generally use old wells for producers. In many repressured areas, cores of the formation have not been examined to determine whether conditions are such that increased efficiency resulting from use of newly drilled wells could warrant the additional capital expenditure. Drilling patterns in these states are ordinarily uniform, and permeabilities of the reservoir rock are sufficiently high to permit development of satisfactory spacing patterns using the old wells.

Difficulties Encountered in Use of Old Wells

Deposition of paraffin or asphaltic residues on the reservoir wall, or in the pores of the reservoir in the vicinity of the well bore, has been advanced as one of the chief difficulties in the use of old wells—particularly for injection purposes.

Deposition of residues is caused mainly by loss of the lighter constituents due to decrease of pressure, aided perhaps by the alternate covering and exposing of the reservoir in wells which are pumped intermittently, and which have the pumps set at the base of the producing formation.[13] This condition is more prevalent in the shallower areas where bottom-hole temperature is comparatively low. Satisfactory results of bottom-hole heating of wells in the eastern fields by steaming or chemical reaction attests to the fact that some deposition must occur. If not removed prior to conversion of the well to input, such deposition would seal off certain portions of the reservoir to penetration of the injection medium. Little difficulty is encountered in the Mid-Continent area with deposition of residues in the formation. Usually no attempt is made in these areas to dissolve the hydrocarbon residues, if such exist, prior to converting an old well to water- or gas-injection well. In a new area, where possible deposition is suspected, it would be advisable, before using old wells for injection purposes, to use methods subsequently discussed for cleaning the reservoir wall.

Precipitation of mineral salts on the reservoir wall, consisting primarily of calcium carbonate, or barium, strontium, or calcium sulfate (gypsum) is occasionally encountered in old wells. This precipitation usually results from the mixing of formation water with upper waters entering the well through casing leaks; however, deposition of carbonate may occur by release of carbon dioxide due to reduction of pressure as the formation water enters the well bore.

Gas or barren zones, which may exist at the top of the oil pay, are ordinarily not cased off in the old wells. If the old wells have been shot, the walls of the formation are usually too irregular to permit successful setting of packers to exclude these zones. Such zones may be detected by core analysis in new wells, and may be "cased off" in order to obtain the maximum efficiency of the injection medium.

Bottom-water zones, in which the pressure is exhausted and the water is lying dormant in the lower portion of the formation, also present difficulties in old wells—both in recognition of this condition, if not discernible from lease or well records, and in plugging off the zone in wells which have been shot.

Early practices in completing old wells drilled with cable tools consisted of setting the oil string at some distance above the top of the sand—both for the purpose of obtaining a good "seat" for the casing, which was usually not cemented, and of facilitating shooting of the reservoir rock without damaging the casing or seat. Quite commonly in certain areas, "thief" zones, such as coal or lignite seams or fractured formations, are exposed in the interval between the casing seat and the top of the producing formation. These zones accept water readily unless isolated from the injection medium by casing, or tubing and packer. Even though no thief zone is present an expenditure is necessary to recondition a well for water-injection purposes in cementing the casing seat to prevent circulation of the injected water. Gas-injection wells ordinarily do not require cementing of casing seats, as injection pressures are lower than in water-injection wells.

Water intrusion into the reservoir in old wells, creating a "water-logged" condition of the sand body surrounding the wells, is another problem occasionally encountered. This condition is frequently the result of leaky casing or faulty casing seats. If any appreciable amount of water has entered the reservoir, the well can never be utilized as a producing well in secondary-recovery projects with satisfactory results.[14, 15] This is manifested by specific instances in practically every area of the country where secondary-recovery operations are conducted. If only a small amount of water

has entered the well bore to cause a "water-logged" condition in the immediate vicinity of the well, the injection of oil or gas into the well to dissipate the water and increase the permeability of the reservoir rock to the hydrocarbon fluid phase is recommended before an attempt is made to use such well as a producer. Water-logged wells can, however, usually be used as input wells. Before a pattern project utilizing old wells for producers and inputs is started, it is advisable to determine the existence of such water-logged wells, and design the pattern so that such wells will be used for injection—even though it means changing the pattern to the extent that several injection wells will be adjacent to one another.

At best, any water intrusion into the reservoir in scattered areas prior to planned water-flooding application will leave some unrecoverable oil trapped in the reservoir. Operators having shutdown wells in potential secondary-recovery areas should take the utmost of precaution to insure that the producing formation in such wells is protected from upper-water intrusion. Casing leaks may occur in such wells and not be discovered for months, or perhaps years, and irreparable damage done in the meantime. At the small expense of setting a bridge above the formation, assurance of protection of the reservoir from water intrusion is obtained. A wood bridge plug or forked-tree top run to the desired depth, and capped by a few feet of rock and a few sacks of cement, will be sufficient. Mudding of the pay formation rather than setting a bridge is not recommended.

Reconditioning of Old Wells

The essential purposes of reconditioning old wells in conversion to input wells are:

1. To remove obstructions from the well bore or reservoir wall which would prevent or deter the input medium from penetrating the reservoir.

2. To confine, insofar as possible, the input medium solely to the pay section, where the maximum useful work will be done.

Methods used to clean the reservoir wall or shot hole of old wells have been discussed by Reistle,[15] Taylor,[16] Shea,[17] and others. Such methods are as follows:

1. Cleanout tools
2. Shooting:
   a. Nitroglycerin
   b. Marble
3. Application of heat:
   a. Steaming
   b. Hot-air circulation
   c. Carbide
   d. Berite
   e. Reaction of sodium hydroxide or acids on metals
   f. Electrical element
   g. Down-hole fire
4. Paraffin solvents
5. Acids:
   a. Hydrochloric
   b. Mud

Cleanout operations in most areas are accomplished by using standard cable tools employing in some instances wall-scraper, under-digger, or "kick-off" tools. Debris is removed from the hole by bailer or pump.

Nitroglycerin shots are frequently used in the cleaning-out process to open up new fissures and crevices, and expose a clean wall of reservoir rock. This is usually done where it is believed accumulation of residues is existent in the reservoir adjacent to the well bore that will not be removed by other methods. Squib shots, using two-inch or 2½-inch shells, are commonly used in preference to heavier shots which might damage the casing or cause excessive cleanout time. Liquid nitroglycerin is generally preferred to solidified nitroglycerin for its presumably better fracturing effect. The use of the electric log to locate accurately the producing sand is recommended to facilitate proper placement of the shot in the event sand records are inadequate.

Marble shots[18] have recently been developed for the purpose of cleaning the reservoir wall. Glass marbles are placed in a cardboard or tin shell around an inner tin shell holding about 0.4 quart per foot of liquid nitroglycerin, which, when detonated, forces the marbles against the rock walls of the formation with such force that the marbles penetrate the rock and disintegrate—enlarging the well bore and exposing a clean rock face. Cleanout time is reportedly less than when using a conventional shot, and sand tamping is not required. This method is relatively new, and will require testing and comparison in various areas before its general utility will be proved.

Removal of paraffin from the well bore by application of heat has been practiced for many years in the attempt to increase the productivity of wells. The use of heat in reconditioning old wells for input wells in areas where paraffin deposition occurs is additional assurance that a clean well bore would be exposed to accept the injected medium. No heating method can be designated universally as the "best" method. Past experience in each area will indicate the method to be used, considering effectiveness and economics. The ideal method for conditioning input wells would be to melt and remove the paraffin from the reservoir surrounding the well bore, as well as to remove the accumulation on the sand wall. In a reservoir depleted of pressure, it may be impossible to remove the melted paraffin from the formation adjacent to the well bore because of insufficient pressure to force it into the well bore. Under such conditions it would be better to attempt to dissipate the melted material over a larger sand area by forcing it back into the sand by application of pressure. If the well is to be used for an air- or gas-input well, injection of the input medium without cooling for a period of time may well serve the purpose. For a water-input well, steam, hot water, or hot oil can be injected.

Paraffin solvents such as gasoline, kerosine, carbon tetrachloride, carbon bisulfide, and several less commonly known substances have been used effectively in dissolving paraffin in well bores. They are usually used when paraffin conditions are less severe.

Hydrochloric (muriatic) acid is used where calcium-carbonate scale may have been deposited on the sand face. Commercial hydrochloric acid is suitable for use. It may be dumped into the well bore, run through tubing, or deposited by bailer—whichever seems the best to use in the individual case. After permitting it to remain in contact with the sand for a period of from two to six hours, the spent acid is removed. An appropriate inhibitor should be used to minimize the reaction of the acid on the pipe. If deposition of the carbonate has occurred in the sand pores near the well bore, it is advisable to spot a second batch of acid and displace it into the sand with a water or oil load at a slow rate.

Barium, strontium, and calcium sulfate cannot be dissolved by ordinary acids. Patents have been issued on the use of: (a) potassium hydroxide,[19] and (b) barium chloride in conjunction with hydrochloric acid[20] in effecting removal or disintegration of a calcium-sulfate (gypsum) deposit. Shooting of the well to fracture such deposits on the walls of the reservoir is generally practiced. "Mud acid" has application where clays may have become lodged on the walls of the reservoir, obstructing the passage of the injection medium.

Cementing of casing seats to prevent injected water from circulating behind the casing is accomplished by setting a bridge below the seat to prevent the cement from going into the pay formation. In the event the hole below the seat is enlarged to the extent that a bridging plug cannot be set, the hole is filled with sand or gravel with a sack or two of Calseal serving as a cap. If full circulation is established without difficulty, the cement—50 to 100 sacks—is pumped into the casing, followed by a plug which is stopped about 25 feet above the seat. If full circulation is not easily obtained, the casing is ripped a joint or two off bottom to insure placement of the cement behind the pipe. After the cement has set, the plug left in the pipe is drilled out, and the casing is tested with water pressure before the bridge is drilled out.

Casing leaks are located by pumping a plug, which will stop at the location of the leak. A bridge is formed in the pipe below the leak by dumping rock and cement on top of the plug and the cementing process performed as described previously.

In injection wells, packers are often run on tubing and set below the leak. However, it is difficult to obtain a shutoff in the old casing without placing cement above the packer. The objection to the use of tubing or casing of small diameter lies mainly in the difficulties of restriction of hole size in subsequent remedial work.

Hydraulic Pressure Packer

Formation packers, which are required to set against the formation wall, are designed with extra-long rubbers, and generally require cementing to obtain a shutoff. With an enlarged or eccentric hole diameter, the cement may bypass the packer and enter the shot hole. A sand and gravel bridge on top of the packer, before the cement is placed, is used as a precaution against such contingency. A packer operated by hydraulic pressure and designed to fit tightly against the irregular walls of an open hole has recently been developed. The setting can be made permanent by cementing while the packer is expanded. A burlap or "poormans" packer, consisting of numerous strips of burlap, five feet in length, wired tightly to the bottom of a three-foot nipple slightly smaller in diameter than the size of the hole, has been effective in obtaining a shutoff in open holes. The packer is lowered to a point slightly lower than the desired shutoff point, then raised to tighten the burlap against the wall of the hole. Cement is then placed on top of the packer.

Tubing is often run in old wells to be

used for input, with a packer set at the top of the producing formation to protect the casing string from possible failure due to pressure exerted by the input medium.

Abandoned wells are occasionally redrilled or "washed down" in a secondary-recovery program. This is a rather hazardous procedure unless it is certain that the hole is free from iron in the form of unrecovered casing and tubing, or miscellaneous items dropped into the hole at the time of abandonment to "clean up" the location. In the event iron is encountered in the redrilling process, it is usually less expensive to move off and drill a new well than attempt to fish out or sidetrack the iron.

Economic Considerations Affecting Intensity of Development

It has been shown[8] that, in the Venango district of Pennsylvania, intensive repressuring results not only in quicker recovery and monetary return, but also in increased ultimate recovery. This is due in part to the fact that the reservoirs in this area consist of small lens and pod-shaped bodies of sand more or less isolated from one another by relatively impermeable beds of fine sand and shale. However, the better recoveries from the more closely spaced developments may have been largely due to greater volumes of repressuring medium injected into those lenses. The same recoveries might have been obtained by injection of larger volumes into fewer wells.[21] Another condition characteristic of the sand body in this area is extreme variation of permeability, with some "loose" zones ranging up to several thousand millidarcys. If not segregated from the rest of the sand by packers, such zones would take **practically all of the injection medium**; would soon be flushed out to create a bad bypassing condition; and make it impossible to recover the oil in the tighter parts of the sand. It has, therefore, been customary to drill new injection wells so that they may be cored and packers set.

The combination of circumstances that makes new drilling and intensive repressure development in the Venango district necessary and economically possible to achieve might not be duplicated in many areas of the country. If the sand occurred at greater depth, with attendant higher drilling costs, or the crude oil price comparable with that outside the Penn Grade region, such intensive development would be economically infeasible.

New secondary-recovery projects in other parts of the country will undoubtedly be planned, so that full advantage can be taken of the existing wells in order to keep development costs at a minimum. Until the economic advantages of more intensive development are disclosed, the operator will not be inclined to deviate from this practice.

The question of proper rates of travel of the injection medium through the producing formation enters into the problem of intensity of development which is inherently associated with the use of old wells. In practice, daily water-injection rates vary from one to 20 barrels per vertical foot of sand, and daily gas-injection rates from 500 to 20,000 cubic feet per vertical foot at standard conditions. For the scope of this paper it must be assumed that in each specific case the rate is "correct," and that the rate was determined by technological considerations of reservoir conditions. However, it is quite likely that individual opinions account for the widespread divergence in injection rates. The use of injection rates of "1000 cubic feet of gas" or "two barrels of water" per vertical foot of sand—because such rates were commonly applied elsewhere—has frequently caused discouraging results in new areas. Many projects using old wells and wide spacing have been classified as failures because injection rates were too low to give adequate results within reasonable time.

Conclusion

In general, old wells can be satisfactorily adapted for use in a secondary-recovery program. Development costs can be substantially reduced by utilizing old wells for both input and producing wells. Such practice will make secondary recovery feasible in the deeper reservoirs, and will spread its field of application to every oil-producing area in the country.

Acknowledgment

The helpful comments and suggestions of H. H. Kaveler, H. S. Kelly, and L. L. McWilliams, Phillips Petroleum Company, Bartlesville, Okla.; Paul D. Torrey, Houston; and Parke A. Dickey, The Carter Oil Company, Tulsa, are much appreciated.

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Katy Field

• CONTINUED FROM PAGE 32

increase tubing corrosion. The lowering of the pressure in the gathering system, amounting to about 325 psi, will probably reduce the corrosion in the well heads and gathering system, so that it will become a minor problem or it will reduce the amount of chemical required to prevent corrosion.

Conclusion

Corrosion encountered at Katy is typical of that found in many condensate fields. Experience in that field will aid in minimizing corrosion losses in other fields.

Two methods of preventing corrosion, viz., (1), use of plastic-coated steel and, (2), use of neutralizing agent, appear to be useful for reducing the corrosion expense at Katy. The chemicals tried as inhibitors have not been satisfactory. Other chemicals are being tried in individual wells.

Research work has aided materially as a background for full-scale field experiments. Considerably more research is required to obtain a better understanding of phenomena observed in the field. Continued research is needed to cope with continuously changing conditions in condensate fields and to correlate more closely field tests with laboratory tests.

Continued support should be given to the NACE high-pressure well-corrosion committee in an effort to hasten the systematic testing of alloys in condensate-well service.

Operators should expect corrosion in condensate fields, and should take corrosion into account when developing new fields or when reworking old fields.

Inspections made early in the life of a field would result in equipping wells so that corrosion control is facilitated, and will reduce corrosion losses.

In fields where corrosion is found, early field trials of promising methods should be made rather than waiting until all of the questions are answered by laboratory studies.

Keeping equipment in a safe operating condition is considered more important than the monetary losses due to corrosion in condensate fields.

Acknowledgment

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The kind permission of the Humble Oil & Refining Company to publish this paper is appreciated.

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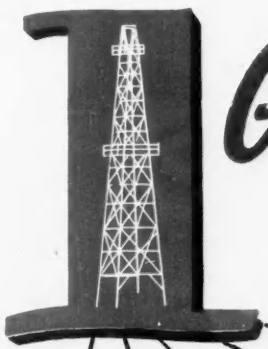

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Gas-Condensate Reservoirs . . .

By O. F. THORNTON,
The Texas Company, Houston

GAS-CONDENSATE fields (also called gas-distillate) are today quite commonplace on the Louisiana and Texas Gulf Coast, but are not confined to that area. The frequency with which they are being discovered and their economic importance in the petroleum industry have increased tremendously with the trend toward deeper drilling. A common understanding of best operating practices by oil operators, land or royalty owners, regulatory bodies, and legislators is necessary if all parties of interest are to cooperate in realizing the maximum potentialities from these fields.

During the past decade in particular, much has been learned and written regarding each of the many phases of gas-condensate operations. It is the purpose of this paper to review the accepted practices, so that the modern basic thought may be available in summary form.

For the purpose of this review, all underground sources of supply from which condensate can be produced profitably and sold are called gas-condensate reservoirs. The name is prefixed with "gas" to emphasize the fact that the condensate is associated with gas when produced. Three different types of gas condensates have been recognized. Their differences are pointed out, and the operating practices applicable to reservoirs containing each are summarized in the paragraphs which follow. The methods used to evaluate gas-condensate reservoirs, and the basic principles governing the selection of the best method of operation for a particular reservoir, also are outlined.

What Is Condensate?

The terms used in discussing gas condensates have not crystallized as yet into a standard nomenclature. For instance, both distillate and condensate are used synonymously to describe the liquid produced in the tanks. It has been necessary herein to adopt somewhat arbitrarily a set of terms, and to explain the meaning of each term as introduced to avoid confusion.

All are more or less familiar with the fact that some wells produce, together with large volumes of gas, a water-white or light straw-colored liquid which resembles gasoline or kerosine. This liquid has been called "distillate" because of its resemblance to products obtained in the refinery by distilling the volatile components from crude oil. Also, it has been called "condensate" because it is condensed out of the gas produced by the well. The latter term shall be used throughout this paper.

Condensate differs markedly from conventional "crude oil." The color of crude oil is usually dark green or black; it feels oily when rubbed between the fingers; it contains some gasoline, but usually is made up in larger part of dark-colored, "heavy" non-volatile components; its API gravity, which is a measure of its weight or density, is commonly less than 45. On the other hand, condensate is light-colored; it evaporates rather easily as compared with crude oil; it contains a large amount of gasoline and other volatile petroleum components; its API gravity usually is above 50.

Table 1 is a comparison of a typical condensate with a crude oil which brings out the differences discussed previously herein. Also shown is the amount of gas produced with each, expressed as cubic feet of gas per barrel of liquid. The gas-to-liquid ratios of wells producing gas condensate usually range from 10,000 cubic feet to more than 100,000 cubic feet per barrel. Gas is produced with crude oil usually in ratios of 100 to over 1000 cubic feet per barrels, or much less than with gas condensates. As will be discussed later, however, some wells produce gas condensate with ratios of less than 10,000 cubic feet per barrel.

Now the most important property of condensate from the standpoint of operation of gas-condensate fields is this: The condensate can be "dissolved" entirely in the gas with which it is produced if the temperature is sufficiently high and if there is enough gas present. This fact is not surprising, because the condensate is light and volatile, as pointed out hereinbefore. Indeed, it is the reverse statement of the familiar phenomenon that a liquid can be condensed out by cooling or chilling many gases.

The temperatures in underground reservoirs containing gas condensate range from 100 to more than 250° F., as measured with thermometers lowered to the bottoms of wells. Similarly, pressures measured with recording gages lowered into the wells are from 1000 to over 6000 pounds per square inch. These conditions are favorable for the gas-condensate mixture to be completely in the gaseous state in the reservoir.

TABLE 1

Comparison of Condensate and Crude Oil

	[redacted] White Gasoline	Gulf Coast Condensate	Crude Oil
Gravity, deg. API	59	54.7	38.6
Color	Water-white	Light-straw	Dark-green
Gasoline, percent	100	70	31
Kerosine, percent	....	16	16
Heavier than kerosine, percent	....	14	53
Cubic feet of gas per barrel of liquid	Distilled from a crude oil	18,200	900

Composition of Gas Condensate

Knowledge of the gas-liquid ratio and the gravity of the liquid is not sufficient to describe the composition of gas condensate for all purposes. Both the ratio and gravity of condensate depend upon the temperature and pressure at which the separation is made. Therefore, it is customary to express composition in terms of the percentage of each hydrocarbon in the gas, in the condensate, and in the gas-condensate mixture. These percentages are obtained by analyzing the gas and condensate produced, or by analysis of a sample taken at the bottom of a well.

The gas produced from most gas-condensate reservoirs is predominantly methane and ethane with smaller amounts of propane, butanes, pentanes, hexanes, and heptanes and heavier, decreasing in that order. The condensate is predominantly heptanes and heavier, with decreasing amounts of hexanes, pentanes, and butanes, and smaller amounts of propane, ethane, and methane. The percentage composition of both the gas and condensate portions of a typical gas condensate are shown in Table 2. Also, the analysis of the gas condensate as it existed in the reservoir is given. These analyses are compared with those of a crude-oil-gas mixture.

The main difference between the gas condensate and the crude-oil-gas mixture noted from Table 2 are (1) the gas condensate contains relatively large amounts of methane and ethane, which are gases; (2) an appreciable portion of the condensate is composed of propane, butanes, and pentanes, whereas the crude oil is predominantly "heptanes and heavier"; (3) the characteristics of the heptanes and heavier in the condensate and in the crude oil are quite different. That of the crude oil is much heavier, as denoted by its low API gravity and its high molecular weight. Propane, butanes, and pentanes are hydrocarbons which can be recovered and sold as liquids if the gas is processed through a plant, but which are not recovered efficiently by conventional separator operation. For this reason, it is usually desirable to consider recovery processes which are more efficient than ordinary low-pressure separators when operating gas-condensate reservoirs, in order to extract these hydrocarbons as liquids.

Wet Gases

The most familiar gas-condensate reservoirs are of what here will be called the "wet-gas" type. This name is adopted merely as a convenience to distinguish them from the other types of reservoirs discussed. Examples of wet-gas reservoirs are the Richland field of North Louisiana and some of the Appalachian gas fields of the East. Very few of the

A Review

TEN years of operation of gas-condensate reservoirs has verified the necessity for and practicability of cooperative and unitized operation. Three types of gas condensates now are recognized: wet-gas, retrograde-gas, and reservoir-liquid. The operating method for each reservoir should be based upon the characteristics of the gas condensate at reservoir conditions. Other factors such as richness of the gas, size of the reserve, capacities of wells, nature of the reservoir, and mode of occurrence of the gas condensate must be considered. Marketing conditions, tax position, and other factors also are important. Due to the increasing volume of the gas market, and prospects for chemical conversion of gas to liquid fuel by the Fischer-Tropsch process, many operators will be required to make a choice or compromise between complete pressure maintenance and gas sales. This can be done intelligently with known methods of evaluation.

O. F. Thornton

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recently discovered gas-condensate fields of the Gulf Coast are of this classification.

Gas produced from a wet-gas reservoir by a well can be passed through a separator operating at a temperature close to that of the atmosphere and a pressure of approximately 500 psi., and a condensate can be recovered. The liquid may be so small in amount that separators are not required; instead, the liquid collects in "drips" installed in the flow line, and periodically is blown out. In some cases the quantity of liquefiable hydrocarbons is large enough to justify the construction of a large extraction plant.

As the gas is produced, pressure in the reservoir drops at a rate dependent on the rate of gas production and the producing capacities of the wells decline. The amount of liquid recoverable from each thousand cubic feet of produced gas, however, remains constant throughout the producing life of a field containing wet gas. The field is abandoned when the pressure in the reservoir has dropped to such a low value (usually less than 500 psi) that the volume of gas and condensate which can be sold from each well is not sufficient to pay operating expenses. In some cases water encroaches into the reservoir and, therefore, the pressure is maintained at a high level. In this event, the field is abandoned when water has flooded out all the wells.

In Figure 1 are shown typical performance characteristics of a hypothetical wet-gas reservoir. The decrease in reservoir pressure, and the constancy of the yield of condensate, will be noted. The distinguishing feature of wet-type gas-condensate reservoirs is this: The amount of recoverable liquid which is contained in each thousand cubic feet (often abbreviated mcf) of the gas produced by the wells remians the same at all times. The percentage of the condensate and liquefiable hydrocarbons ultimately recovered from the reservoir, therefore, is equivalent to the percentage of the gas recovered.

It is possible to obtain a sample of the gas-condensate mixture as it exists in the reservoir by lowering a special container down into a well. By a suitable remotely controlled valve arrangement, the sample can be sealed in the container at the bottom of the well, so that the gas condensate does not escape when the "bottom-hole sample" is brought to the surface. Such a sample can then be taken into the laboratory and placed in a bath of the same temperature as that at the bottom of the well. By this means, the condition of the gas condensate mixture as it existed in the reservoir can be observed. It is found that, in the case of wet-gas reservoirs, the gas condensate is completely in the gaseous state at reservoir conditions.

Removal of gas from the reservoir can be duplicated in the laboratory by opening a valve on the sample container and bleeding off the gas.[1] In the laboratory, as in the field, it is observed that the amount of condensate recoverable by cooling the "produced" gas to the temperature of the atmosphere in a separator remains constant at all times. No liquid drops out in the sample container, however, so long as the temperature is maintained at that of the reservoir. In this respect, the wet-gas type differs from a second class of gas-condensate reservoirs which will be discussed hereinafter.

Retrograde-Type Gases

Typical and well advertised examples of the second type of gas-condensate reservoir are the Big Lake field, Reagan County, Texas,[2] and the La Blanca field, Hidalgo County, Texas.[3] Here, as in the case of the wet-gas class discussed hereinbefore, a liquid condensate was recovered by passing the gas produced by the wells through separators operating at atmospheric temperature. As the gas was produced, pressure in the reservoir dropped. However, in these cases it was observed that, as the pressure dropped, the yield of condensate from each thousand cubic feet of gas declined. In this later respect it differed from the wet-gas type. Figure 2 shows how the condensate in gas from 19 wells in the La Blanca field[3] declined from 31 barrels of liquid (pentane and heavier) per million cubic feet of gas (often abbreviated Mmcf) down to 22 barrels per million in 3 years—a reduction of 29 percent. Obviously, a considerable portion of the condensate remained in the reservoir and was not produced. The loss of this condensate was of sufficient magnitude to be of economic importance.

Again, an explanation of the observation made in the field can be obtained in the laboratory. A bottom-hole sample from a La Blanca well[4] was placed in a bath at reservoir temperature as previously described. The material was found to be entirely in the gaseous state. However, when removal of gas from the reservoir was simulated by dropping the pressure in the sample container held at reservoir temperature, it was observed that a liquid was condensed within the container.

A logical explanation of what happens in the field is apparent. When the pressure is dropped, due to withdrawal of gas, a liquid condenses in the reservoir. This liquid, composed largely of condensate otherwise recoverable at the surface, "wets the sand" and, therefore, cannot be produced by the wells.

This type of condensation which is attributable to a drop in pressure while the temperature of the gas remains con-

TABLE 2

Compositions of a Retrograde Gas and a Crude-Oil-Gas Mixture

	RETROGRADE GAS			CRUDE-OIL-GAS MIXTURE		
	Gas	Condensate	Reservoir Fluid	Gas	Oil	Fluid Reservoir
	(All Figures in Mole Percent)					
Methane	91.32	.....	87.07	92.80	.....	57.83
Ethane	4.43	.....	4.39	3.79	.....	2.75
Propane	2.12	1.41	2.29	1.97	1.61	1.93
Butanes	1.36	5.71	1.74	0.96	2.24	1.60
Pentanes	0.42	8.11	0.83	0.28	2.45	1.15
Hexanes	0.15	10.46	0.60	0.13	3.47	1.59
Heptanes and heavier	0.20	74.31	3.08	0.07	90.23	33.15
Total	100.00	100.00	100.00	100.00	100.00	100.00
API gravity of heptanes and heavier, deg.		51.2			36.9	
Molecular weight of heptanes and heavier		157			226	

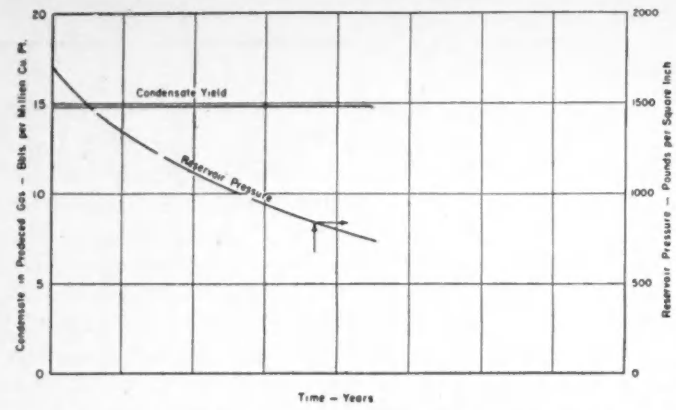
Condensate Yield
Reservoir Pressure
Condensate in Produced Gas – Bbls. per Million Cu. Ft.
Reservoir Pressure – Pounds per Square Inch
Time – Years

Figure 1 (above). Performance characteristics of reservoirs producing distillate-type gas.

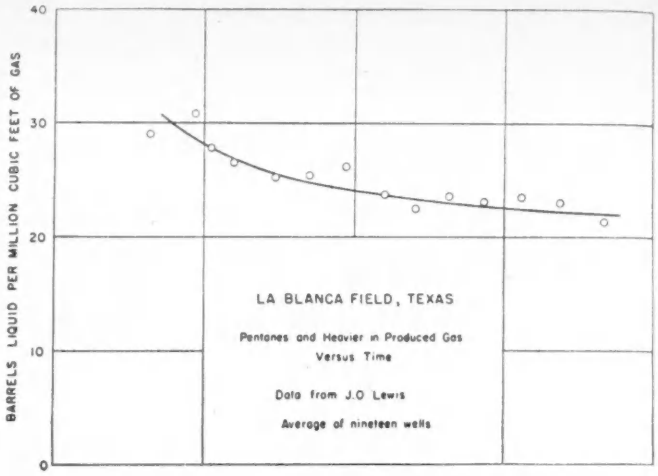
BARRELS LIQUID PER MILLION CUBIC FEET OF GAS
LA BLANCA FIELD, TEXAS
Pentanes and Heavier in Produced Gas Versus Time
Data from J.O Lewis
Average of nineteen wells
TIME – YEARS

Figure 2 (right). Decline in condensate yield from a retrograde-type gas.

stant, is called "retrograde condensation." Similarly, the gas condensates, from which such condensation is observed at reservoir temperatures, are called herein "retrograde gases." Most of the gas-condensate reservoirs contain gases of this type.

It has been observed in laboratory tests that the amount of liquid which drops out by retrograde condensation is higher for richer gases, i.e., those from which larger condensate yields are obtained. It has been estimated[5,3] that approximately 50 percent of the recoverable liquid content of some gas condensates would be lost by retrograde condensation in the formation if the reservoir were produced and the pressure allowed to decline. In the case of "lean" retrograde gases the loss would be less. The laboratory evaluation of the amount of possible retrograde loss, using bottom-hole samples made by combining surface gas and liquid, has been described in the literature.[1]

In order to reduce the loss due to retrograde condensation, the process called cycling (or recycling) has been developed. By this operation, gas condensate is produced from strategically located wells, the liquefiable hydrocarbons are removed, and the stripped gas, instead of being sold, is compressed and returned to the same reservoir from which it was produced through injection wells. These injection wells are also located strategically, and some distance from the producers. By injection of residue gas, pressure drop in the reservoir is prevented and, therefore, retrograde condensation is held to a minimum. Eventually, the injected "dry" gas displaces most of the "wet" gas between the injection and producing wells. These latter wells then begin to produce some of the dry gas, and the amount of wet gas produced begins to decrease. When the amount of dry gas becomes so large that the liquefiable hydrocarbons recovered from the small volume of wet gas will not pay operating expenses, the cycling process is abandoned. The gas in the field then can be sold, and reservoir pressure allowed to decline as in the case of the wet-gas type. It is estimated[6,7] that between 60 and 80 percent of the condensate in a reservoir can be obtained by cycling. If cycling is followed by gas sales, the recovery may, of course, be increased—possibly to 80 to 90 percent.

A map (Figure 3) shows a typical arrangement of wells in a cycling project, with daily volumes produced and injected per well. Also, the area occupied by dry gas at a particular time is designated to illustrate the mechanism of wet-gas displacement.

The area shown in Figure 3 as being occupied by dry gas was determined by what is called a "model study" of the reservoir.[8] It can be shown that the flow of gas in a reservoir follows the same pattern as the flow of electricity in a conductive "model" of the field. These models are built to scale, and current is put in at points corresponding to injection-well locations, and current is taken out at producing wells. The amount of current per well is made proportional to the volume of gas produced by, or injected into, the well. By actual experience, it has been found that the dry-gas patterns determined by model study agree reasonably well with those obtained by observing dry gas encroachment into producing wells. Of course, the dimensions of, and conditions in, the reservoir must be accurately known, so that the model is an accurate picture of actual subsurface conditions. The use of electric models as guides by operators of cycling projects now is widespread.

Reservoir-Liquid Type

A few reservoirs recently have been discovered from which condensate and gas are produced, but the gas amounts to only 2000 to 5000 cubic feet per barrel. This latter figure compares with over 10,000 cubic feet from most other gas-condensate reservoirs. Bottom-hole samples from this third class of reservoirs have been studied, and it has been found that at reservoir conditions the gas condensate is not in the gaseous state, but is entirely a liquid.

The liquid produced from these reservoirs is similar to that from other gas condensates. It is light straw in color, has a high API gravity of more than 50, and is relatively volatile. If more gas is mixed with the condensate than was produced with it—say on the order of 10,000 cubic feet per barrel—it can be observed in the laboratory that the mixture is entirely in a gaseous state at reservoir conditions of temperature and pressure.

The condensate from this "reservoir-liquid" type, therefore, has all the attributes of other condensates. However, the amount of gas present with the condensate in the reservoir is not sufficient to "dissolve" it. The mixture is in the liquid state at reservoir conditions. It is thus shown that the classification of a reservoir into one of the three types depends in part upon the amount of gas in the gas-condensate mixture.

Because the gas condensate is a liquid in the reservoir, it may be argued that such a mixture is truly a crude oil, that the operation of the reservoir should be the same as for a conventional oil reservoir. However, the losses which could result from such practices should be pointed out.

First, the loss of butanes, pentanes, and other light hydrocarbons due to conventional separator operation, as compared with plant processing, amounts to 10 to 25 percent or more of the recoverable liquid in the gas condensate.

Second, the recovery from the reservoir by an operation wherein the reservoir pressure is not maintained will be very low—from 10 to 25 percent of the

TABLE 3

Comparison of Gas Condensates with Crude-Oil-Gas Mixtures

	API Gravity of Liquid (Deg.)	Gas-Liquid Ratio (Cubic Feet per Barrel)	Reservoir Conditions		Retrograde Dew Point (PSI)	Bubble Point (PSI)
			Temperature (Deg. F.)	Pressure (PSI)		
Gas Condensate:						
Distillate Gas	65	67,000	160	1,700	.....	.....
Retrograde gas	55	18,500	203	4,810	4,470	.....
Reservoir Liquid	58	2,700	203	4,700	.....	3,855
Crude-oil-gas mixture:						
Mid Continent	38	540	98	1,760	.....	1,700
Gulf Coast	38	900	211	4,750	.....	4,600

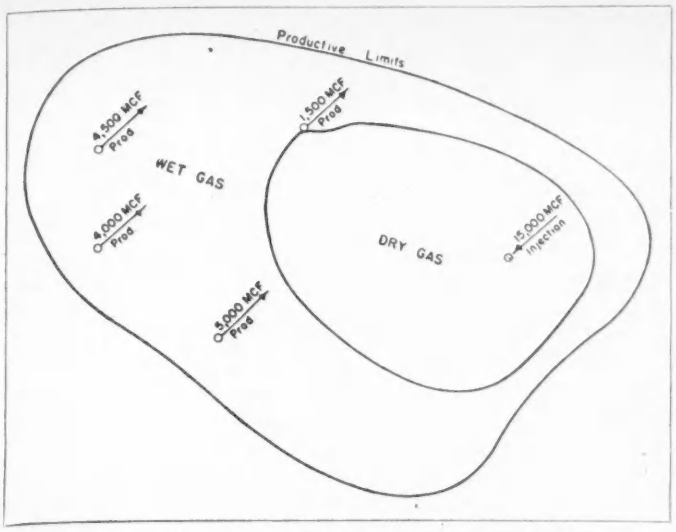

Figure 3. Location of wells in a typical cycling plan.

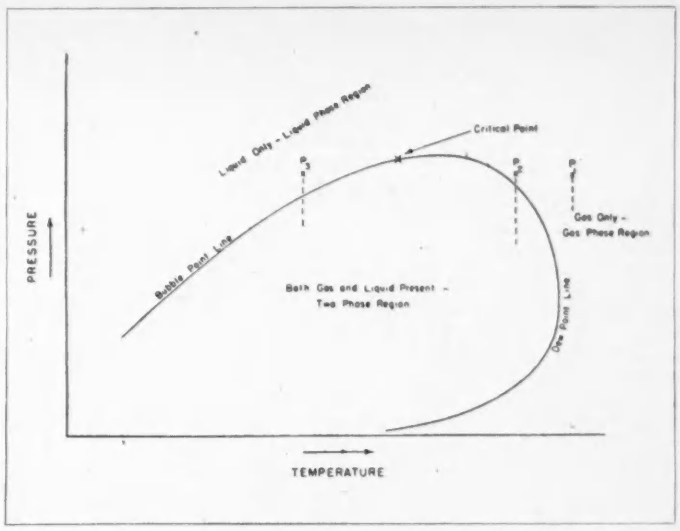

Figure 4. A phase diagram.

amount originally in the reservoir. If pressure is maintained by gas injection, by water injection, or by restricting production to take advantage of natural water drive, the recovery can be increased to 40 to 70 percent or higher.

Relation of Three Types

In discussing each of the three gas condensates, viz., the wet-gas, retrograde-gas, and reservoir-liquid types, it was desirable to describe the properties of the gas condensate in the laboratory under reservoir conditions of temperature and pressure. In order to point out the similarity between the three types, once again laboratory tests will be resorted to.

Assume that another bottom-hole sample of gas condensate is obtained. In the laboratory, it is observed to be entirely in a gaseous state at reservoir temperature and pressure. Now, instead of reducing pressure in the container by bleeding off gas, let the pressure drop be accomplished by expanding the size of the container. This may be done by a movable piston in one end of the container. Further, inasmuch as conditions can be varied at will in the laboratory, observations can be made at any desired temperature in addition to that of the reservoir. Therefore, the characteristics of the gas condensate can be observed at a great many combinations of pressure and temperature.

The results of a number of such observations for a given gas condensate can be summarized as follows: At high temperatures, the mixture is entirely in the gaseous state or phase, and it remains gaseous at all pressures. This condition corresponds to the distillate-type gas. At slightly lower temperatures, the mixture is in the gas phase at high pressures, but, when the pressure is reduced, a liquid phase condenses. This corresponds to the retrograde-type gas. At still lower temperatures and high pressures, the mixture is entirely in a liquid phase. When the pressure is reduced, a gas phase forms; and two phases, viz., a liquid and a gas, are present. This corresponds to the reservoir-liquid type. Therefore, it is seen that the particular type of classification into which a gas condensate falls depends not only on the amount of gas in the gas condensate as discussed hereinbefore, but also on the temperature and pressure of the reservoir. The same gas-condensate mixture can be classed as any of the three types, dependent on conditions.

Figure 4 is a picture of the previously given word summary, called a "phase diagram." There are three regions on this diagram: in one, the pressure and temperature are such that only a gas phase is present; at slightly lower temperatures and at intermediate pressures, both gas and liquid phases are present, i.e., a two-phase region; at lower temperatures and high pressures, only a liquid phase is present.

Assume that reservoir conditions of temperature and pressure correspond to the point P_1 in the diagram. The mixture is entirely in the gas phase. If, at the constant reservoir temperature, the pressure were dropped (as by production of gas from the reservoir), the corresponding path on the phase diagram would be a vertical line from P_1. It will be noted that such a line does not enter the two-phase region; the mixture remains entirely a gas, or behaves as a wet-gas.

If pressure-temperature conditions of the reservoir were equivalent to those designated by P_2, the mixture would be in a gaseous state. If, at the constant reservoir temperature, the pressure were dropped (as in the La Blanca field), a liquid would condense. This is shown in the phase diagram by the vertical line crossing into the two-phase region. Consequently, the mixture would be classed as a retrograde gas. The pressures at which the liquid first began to condense is called the "retrograde dew point." if the pressure were dropped to a very low value (an extension of the vertical line from P_2), the region wherein a gas phase only is present again would be entered. This means that the liquid which condensed as described would revaporize if the pressure were reduced to a very low value.

In a similar manner, it will be noted that if the gas condensate is at a reservoir temperature and pressure corresponding to P_3, it is entirely in a liquid phase. A drop in pressure causes a gas to be liberated (two-phase region). The pressure at which a gas first forms is called the "bubble point."

It was stated previously herein that at certain conditions the gas condensate was entirely in a gas phase, whereas at others it was wholly a liquid. The question may be asked: "How is it determined that the mixture is a gas and not a liquid?"

At extremely high pressures of the reservoir, many familiar concepts of "liquids" and "gases" no longer apply. For instance, at 6000 psi gases are compressed to about one-fortieth of their volume at atmospheric pressure. A cubic foot of gas is reduced in volume to less than a two-inch cube. At these high pressures, therefore, gases begin to react much like liquids. Conversely, when as much as 2000 to 5000 cubic feet of gas is mixed with a barrel of liquid (about five cubic feet), the mixture begins to react much like a gas at high pressure.

As a matter of fact, there is one condition of temperature and pressure for each gas condensate, called the "critical point" (Figure 4), where it is impossible to distinguish whether the gas condensate is a liquid or a gas. As this point is approached, the gas and liquid phases become identical in all characteristics.[7-9]

Rarely gas-condensate reservoirs have been discovered in which conditions are very close to the critical, but on the liquid side. In such cases, classification of the gas condensate is difficult, and operations should approach those for truly gas-phase reservoirs.

Table 3 gives data for three gas condensates and two crude oils, to illustrate each type of gas condensate discussed previously herein.

TABLE 4
Comparison of Extraction Methods

	Conventional Separation	Multi-Stage Separation	Plant Extraction
1. Barrels of liquid per million cubic feet of retrograde gas.....	52	58	70
2. API gravity of recovered liquid, deg.....	54.7	58.4	64.4

Occurrence with Oil Reservoirs

Wet and retrograde gases often occur as gas caps to crude-oil reservoirs. In

some instances a retrograde gas cap and reservoir-liquid condensate are found in a common reservoir. The amount of oil present in such reservoirs has been found to vary considerably. It may be present only as a thin rim of liquid around the flanks of the structure, and may have no commercial significance—or oil may occupy in excess of 90 percent of the pore space in the reservoir. The relative amounts of oil and gas condensate in such reservoirs have an important bearing upon the operating methods used, and upon the timing of recovery of the two reservoir fluids. In general, the practice has been to give primary consideration to recovery of oil, and recovery from the gas-condensate zone has often been deferred until exploitation of the oil zone was completed. If ownerships of the oil and gas condensate are diversified, some inequity of income at times may result in such cases.

More often than not several gas-condensate reservoirs are found in the same field. The integration of the simultaneous operation of two or more such reservoirs calls for ingenuity in well-completion practices and timing of recovery.

Operating Methods

The classification of gas condensates, their properties, and modes of occurrence have been discussed previously herein. The operating methods usually applicable to each type have been generally reviewed. There are, however, many exceptions to the general statements made previously. The selection of a particular operating method for a given field should depend upon certain basic principles which are well known to industry.

The basic principles governing best operating methods for gas-condensate reservoirs are not unique and, according to modern thought, are the same as for most oil reservoirs.[6] However, physical waste due to improper operation is both more serious and more easily discernible in the gas-condensate reservoirs and, therefore, the application of these basic principles has been more the rule than the exception. These principles are (1) selection of operating methods based upon the character of the reservoir fluids; (2) maintenance of pressure in those reservoirs where a decrease would result in loss of recovery underground; (3) efficient handling of produced fluids at the surface to obtain maximum liquid extraction; (4) optimum spacing of wells to obtain highest recovery; and (5) unitization of interests to assure equity to all parties having ownership in the common reservior, and to enable application of principles (1), (2), (3), and (4).

Gas-condensate operations may be divided into two classes: (1) those concerned with efficient recovery of gas condensate from the reservoir through the wells; and (2), those pertaining to extraction of the liquefiable hydrocarbons from the well production. These two classes of operations are in many cases of equal importance. Inefficient extraction can result in losses as great as those due to retrograde condensation, or inefficient recovery.

The "cycling" operation previouly described is now widely utilized for recovering retrograde gases. It is not necessary to cycle wet gases to prevent loss of condensate underground. Often, however, no market for gas exists, and by the cycling process the condensate can be recovered without awaiting the development of an adequate gas outlet. If the wet-gas is the gas cap of an oil reservoir, cycling may enable the recovery of the condensate simultaneously with the oil. Production of the gas for sale obviously would cause oil to move into the gas zone, and result in significant loss of oil recovery. For these reasons, some wet gases may be cycled.

Gas injection to maintain pressure and prevent retrograde condensation is not necessary if water encroaches into the reservoir as a retrograde gas is produced. In the case of wet-gas reservoirs, obviously the pressure need not be maintained, because no condensation takes place in the reservoir as pressure declines. In such cases, when there is a market for gas or when it may be utilized legally for some other purpose, gas-condensate reservoirs may not be cycled. Among other legal methods, in addition to gas sales for which gas has been utilized in such operations, are: injected into an oil reservoir to maintain reservoir pressure and so to increase oil recovery; injection into a gas reservoir of lower pressure for gas storage; and injection into a reservoir containing water for gas storage. The foregoing operating methods and others of similar nature, wherein the pressure in the gas-condensate reservoir is not maintained by residue-gas injection, may be called "gas sales or storage" to differentiate them from "cycling."

In the case of reservoir liquids, maintenance of reservoir pressure is essential. Injection of gas, injection of water, and restriction of producing rate to take full advantage of natural water drive are commonly applied for "pressure maintenance."

Methods of extracting condensate or other liquefiable hydrocarbons from the well production may be classed as (1), separation of gas and condensate in a conventional oil separator operating at approximately atmospheric temperature and a pressure ranging from 100 psi to 500 psi or more; (2), multi-stage separation as described hereinafter; and (3), extraction in a processing plant. These methods are in order of increasing efficiency.

Recovery by a conventional separator is relatively low, ranging from 40 percent or less to 85 percent of that obtainable in a plant, depending upon the composition of the gas condensate. By multi-stage separation, recovery efficiency may be increased over that obtainable by use of one separator. Multi-stage separation (or simply stage separation) is illustrated diagrammatically in Figure 5. Well production enters a separator operating at high pressure, on the order of 1000 psi. The pressure selected usually is the one at which the separator gas retains the least amount of liquefiable hydrocarbons, or the "optimum separator pressure." Liquid from the first separator goes to a second separator at a lower pressure where additional gas is liberated, and so on through additional separators until atmospheric pressure is reached. The temperatures in each of the separators also may be controlled.

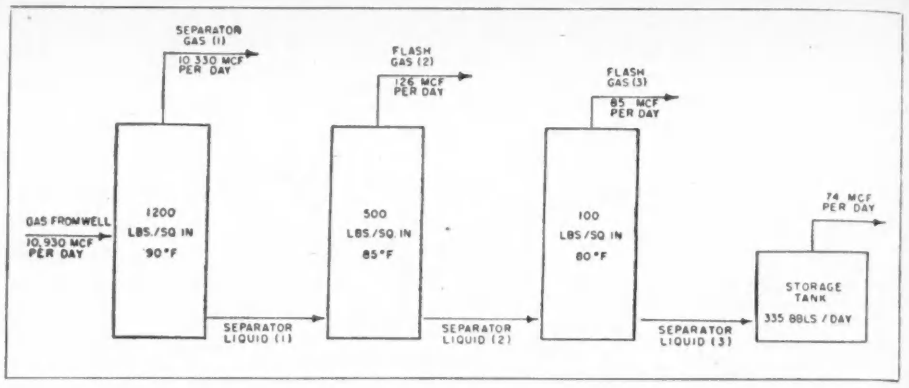

Figure 5. Diagrammatic sketch of a multi-stage separation of gas condensate.

Plant processing is most efficient. Many of the plants in operation today of the absorption-oil type recover in excess of 30 percent of the propane, 80 percent of the butanes, and substantially all the pentanes, hexanes, and heptanes and heavier.

In Table 4 are given the barrels of liquid recoverable by each of the foregoing methods from one million cubic feet of a typical retrograde gas.

Summarizing the foregoing, present operating methods or those utilized in the past for gas-condensate reservoirs are combinations of (1), cycling; (2), gas sales or storage; or (3), pressure maintenance—with one of the three extraction methods, as indicated in Table 5.

Large-volume gas markets have recently been developed on the Gulf Coast, and the possibility of chemical conversion of gas by the Fischer-Tropsch process into gasoline and other liquid hydrocarbons on a large scale promises to increase substantially gas sales over present volume. More and more operators will be required to make a choice or compromise between cycling with complete maintenance of pressure and gas sales. This it is possible to do intelligently by utilizing the current knowledge concerning gas-condensate reservoirs. Underground losses, due to retrograde condensation and recovery by cycling, can both be estimated with sufficient accuracy as outlined in the previous paragraphs.

The operating method used in a particular case depends upon the evaluations of a number of factors.[10] Obviously, the amount of recoverable liquid in the gas is very important. The cycling and plant processing of gas condensates containing less than 20 to 25 barrels of

TABLE 5

Operating Methods—Summary

Recovery Methods	Extraction Methods
1. Cycling	a. Separator—conventional.
2. Gas sales or storage	b. Separator—multi-stage
3. Pressure maintenance	c. Plant

liquid per million cubic feet usually is not financially attractive, unless there is a market for some of the residue gas from the plant. Also, the size of the reserve must be sufficient to pay out plant and well investments and to yield a reasonable return. Many small reservoirs, containing comparatively rich gas condensates, will not support a processing plant and pay out the cost of installing a compressor plant for cycling without some sale of gas concurrent with cycling.

The capacities of wells are an importnat factor. Low capacity means a large number of both producing and injection wells must be drilled, resulting in high investment and operating costs.

Subsurface conditions may be so complex as to make cycling unattractive. The presence of numerous complex faults, erratic shale breaks, large variations in permeability, and other nonuniform conditions may make cycling of reservoirs containing lean gases impractical or unprofitable.

Each reservoir presents an individual problem. The operating method selected depends upon the items discussed previously herein, and also upon marketing conditions, tax position, and other economic factors. Usually the most important single item in making the selection is whether unitized operation is possible.

Unitization

There is now almost universal agreement that unitization of operating and royalty interests is an essential prerequisite for efficient operation of a gas-condensate reservoir. The primary purpose of unitizing operations is to increase recovery of condensate and other liquefiable hydrocarbons, resulting in increased values to the operator, the royalty owner, and society as a whole. In the foregoing sections of this review, unitization has been tacitly assumed in discussing operating methods.

Results of cycling operations have proved beyond doubt that the reservoir containing gas condensates is itself a unit, with no subsurface lease boundaries. The gas is freely migratory, and the amount of recovery from the reservoir is determined by the location of wells—not the number of wells. The operating method used is of primary importance, and it should be selected by study of the reservoir as a whole.

In cycling and other pressure-maintenance operations, the objective of efficient operation is to produce the gas condensate, but not to produce the dry gas, water, or other fluid which displaces the gas condensate from the reservoir. This can be done only by locating and operating wells to take advantage of structural position and other conditions in the reservoir. For most efficient operation, lease ownership should not be given any consideration. However, income must be shared by all leases, and not exclusively by those on whose tracts the producing wells are located. Unitization provides a means of equitably sharing the income.

A brief survey of differences between most oil and gas-condensate reservoirs may serve to clarify the more urgent need for unitized operation in the latter type of field. First, dollar recoveries per volume of the reservoir from gas condensate is much less than from oil. For instance, cycling yields on the order of 20 to 200 barrels of condensate, and 1000 to 4000 mcf of gas per acre-foot, worth approximately $65 to $470 at prices of $1.75 per barrel and $0.03 per mcf, respectively. On the other hand, crude-oil yields are on the order of 200 to 1000 barrels per acre-foot, with possible small additional value for gas produced with the oil. Whereas a profit can be made in most cases by drilling an oil well to each 40 acres, the same is not true of gas condensate. Wider spacing of wells means that a well cannot be drilled on each and every lease and, therefore, units must be formed to prevent gross inequity of income. Second, extraction plants to strip efficiently the liquefiable hydrocarbons from gas condensate require large investments in addition to that for drilling the wells, and it is not often that one operator in a field has sufficient holdings to make the construction and operation of such a plant financially attractive. Third, the actions of one operator in a field affect the operations of all others because of the freely migratory character of gas. This effect is more noticeable in gas-condensate than in oil fields. Thus, one operator by selling gas can (and in some cases has done so) drop the pressure throughout a reservoir containing retrograde gas or reservoir liquid, resulting in damage to any leases wherein operators are maintaining pressure by gas or water injection.

The foregoing and many other advantages of unitized operation are recognized by all. It is beyond the scope of this review to outline all the argument[10] for, or the few against, unitization. It is significant that some states require as a matter of law that, in the event a majority of interests in a gas-condensate field desire to unitize to enable a more efficient operation, others also must do so. However, almost all the units formed up to now have been voluntary. Operators and royalty owners alike have been assured of an overall income under unitized operation greater than would be obtained by non-unitized operation. This usually can be demonstrated because of the fact that total recovery always is greater by unitized operation.

Even when all parties interested in a given field have agreed that unitization is desirable, the agreement upon a basis for participation in a unit is often difficult. The basic principle for participation in most units has been[6,12] that each party should share in the unit in the proportion that the recoverable hydrocarbons under his tract, or the value thereof bears to the total under all tracts. In largely undeveloped fields or those wherein sand conditions are uniform, surface acreage may be an equitable basis for participation. For fields wherein sufficient information is available, the amount of recoverable hydrocarbons can be calculated rather accurately. Net pay thickness, porosity, and water content of the pay are used to calculate the space containing hydrocarbons. The composition of the gas condensate is used to determine what portions of the reservoir fluid are recoverable as liquid and gas. Laboratory tests are made to determine the volume of reservoir space required to hold 1000 cubic feet of gas condensate—more commonly called the volume factor. By combining these factors, the amount of gas and condensate under each tract can be computed.

Many of the objection to unitization arise from the fact that the objecting party does not understand the details of the proposed participation formula. Most of the uncertainties and fears which were at first held have now largely disappeared because of many years of successful operation of unitized projects.

Cooperation between operators, royalty owners, and regulatory bodies is essential to efficient operation of a gas-condensate reservoir. Unitization is the mechanism by which this cooperation can be applied to operation of the field.

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Republican View to Temper National Policy on Oil

For the oil industry, the shift of power in Congress, following the election, will have important results.

It will mean that any national oil policy written next year will be tempered by the Republican viewpoint, traditionally concerned with protection and advancement of domestic industry. Rather than return to isolationist policies, this likely means relaxation of the attempt to remake the world to conform to American ideals; the "good neighbor" spirit will still prevail, but on the theory that the "neighbors" should give as well as take.

A thorough overhauling of taxes immediately rather than just before the 1948 presidential campaign, is likely along with an effort to make good the Republican promise of a 20 percent cut in taxes next year.

It may doom efforts to give the government a stronger control over industry through such means, for instance, as an expansion of the authority of the Federal Power Commission or any concentration of power over the oil industry through any "coordination and centralization" such as the OGD.

It may mean definite, effective opposition to the throwing open of this market to foreign oil apparently sought by the administration through its reciprocal trade agreements and "we're running out of oil" policy.

The strength of the 80th Congress will lie as much in what it prevents as in what it does. It can pass legislation, but the President can veto it; the President can urge legislation and the Congress can deny it.

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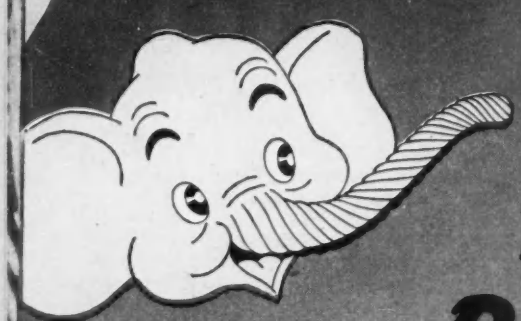

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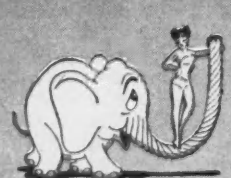

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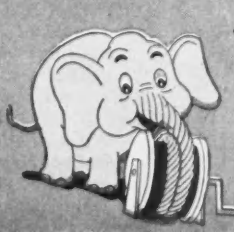

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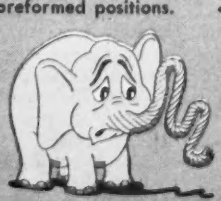

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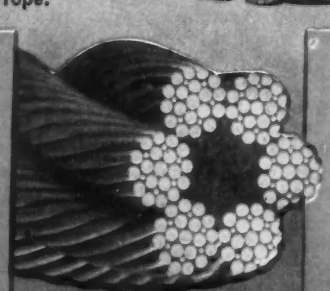

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Flowing WATER-FLOOD PRODUCTION

By T. F. LAWRY, The Ohio Oil Company, Eureka, Kansas

DURING the past ten years of intensive water-flooding in the shallow Mid-Continent area, there has been a revolutionary development in the method of recovering the produced oil. When the first delayed "five spots" were drilled into the Bartlesville sand in Northeastern Oklahoma, with the oil wells flowing as they were being completed, the phenomenon was regarded with curiosity, but hardly as a new production method. Later, as the initial flow of oil declined, and the amount of produced water to be handled daily became a greater problem, the behavior of the earlier flowing oil wells provided a possible solution for the problems of more well-pulling, rod-line failures, greater lifting cost, and early economic life of production by pumping. A. L. Robinson of Forest Producing Corporation, Nowata, Okla.—more than any other person—deserves the credit for recognizing in those early, flowing oil wells a release from many of the mechanical problems that had been accepted as the lot of water-flood operators up to that time.

History of Flowing in Water Flooding

It is not to be assumed that flowing was first discovered in the water-flood operations in the Mid-Continent, but it may be truthfully said that it was first used in that area with success. Flowing was first attempted in water-flood operations in the Bradford field, Pennsylvania, very soon after the five-spot pattern method of development came into use in that field, and has been experimented with in that field almost continuously since its inception there. But, because of the generally low permeability of the producing sand in Bradford, it has always been necessary to use maximum injection pressures in connection with the flowing experiments and, as a general rule, flowing has not been accepted in Bradford. Torrey[1] says that the first experiment with flowing in the Bradford field was also the first instance of breakthrough in water-flooding due to too high pressure. Hughes[2] says that "flowing in the Bradford field has been pronounced inefficient," whereas Andresen[3] has evidence of flowing on one lease in the Bradford field in which production compares favorably with surrounding leases where production was handled by pumping, but that "a good portion of the wells were ruined or rendered inefficient by break-through when injection pressure exceeded the critical." The history of flowing may be summarized by saying that flowing was first tried in the Bradford field and found to be unsuited to the low-permeability sand characteristics of that field. Later, as the Mid-Continent water-flood activity began, the greater permeability of the sands in the latter area proved to be the important sand characteristic necessary for successfully flowing water-flood oil.

The purpose of this paper is to review the advances, as well as the difficulties, which have developed in field practice and in laboratory study on the use of flowing as the means of recovering water-flood production. The general economies of flowing are indicated, and certain specific advantages are outlined. For the sake of comparison, certain economies in handling production by pumping are also given. In a general way, an attempt is made to show when flowing can and should be used in comparison with conditions under which pumping seems to be the more logical method of production.

Use of Flowing in the Mid-Continent Area

Practically all of the fields in which water-flood oil wells are produced by flowing are located in the Mid-Continent region, which comprises Eastern Kansas, Northeastern Oklahoma, and North Texas. There are several reasons why flowing is largely restricted to this area:

1. Most of the pay sands are of shallow depth.
2. The sands have, for the most part, good permeability to water.
3. The sands being water-flooded are not so prolific that any economies which may be effected can be overlooked.

Because water-flooding is a newer art in the Mid-Continent than in the East, there is less tradition to overcome in operations. Squires[4] says the Pennsylvania operator is now coming to realize that the Bradford sand could be flooded in spite of its low permeability, and not because of it. So it may be that flowing would not have worked successfully in the Bradford field, even if it had been the fondest dream of all operators, and not just the experimental work of a few.

The history of flowing water-flood production in the Mid-Continent is similar to that of almost all techniques in the petroleum industry. It began as an experiment at a time when the lease on which it was tried had declined in oil production and gained in water production, until the latter was almost predominant. Figure 1, although chronologically not an early flowing flood, is typical of the case history of many water floods which were converted from pumping to flowing after the economic life by pumping had been reached. The first reaction to the decline suffered upon conversion to flowing was one of doubt: flowing was apparently getting only one half of the oil that could be obtained by pumping. On the other hand, if it was costing more to produce the oil than the oil itself was worth in the stock tanks, the only alternative to flowing was to abandon the lease. This feeling of "having nothing to lose" paved the way for a more common practice of pumping the wells until economic life by pumping had been reached, and then to convert the oil wells to flowing. This was still an expensive procedure, because pumping equipment large enough to handle the peak oil production on the lease had to be installed, and then, later, there was an additional expense in making the change from pumping to flowing. The operator who was not yet ready to accept flowing on equal terms with pumping felt that this was the most certain method by which he could get out all of the obtainable oil. At present the greatest confirmation of the success of flowing in water flooding lies in the increasing tendency of more and more operators to develop their properties, having in mind no other producing method than flowing.

Advantages of Flowing

The more evident advantages of flowing over pumping water-flood production are well known, and have been mentioned in every speech and paper that has been given on the subject. In quick review, they are (1) the capital cost per oil well drilled and completed is less, due to absence of pumping equipment; (2) the oil well produced by flowing virtually operates itself, due to absence of mechanical parts; (3) labor requirements in flowing are much smaller, as well-servicing crews, mechanics, power and rod-line gangs, etc., are not necessary.

Some advantages of flowing over pumping which are not common to all flowing wells, but apply only in local,

FLOWING of water-flood production was attempted very early in the Bradford field, Pa., but did not become popular until the development of water flooding in the shallow Mid-Continent fields. The advantages of flowing over pumping lie in the simplicity of operation, and economy of first cost, as well as of operation. Flowing is used mainly in the shallow water-flood operations in the Mid-Continent sands, in which permeability and viscosity do not seriously retard the injection of sufficient water volume. The experience with flowing to date has been such that there seems to be no difference in the ultimate recovery of water flooding—whether by flowing or by pumping.

(Presented before the Division of Production at the 26th annual meeting of The American Petroleum Institute, Stevens Hotel, Chicago, November 12, 1946.)

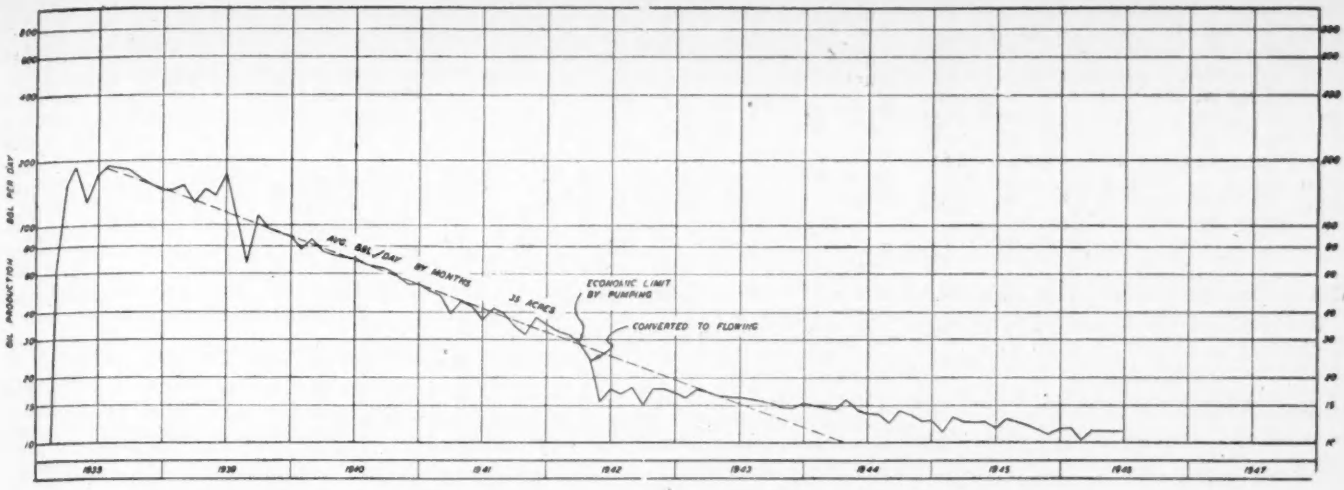

Figure 1. Typical water-flood decline curve, showing long depletion period possible by flooding.

specific instances worthy of mention are

1. A flowing well can be completely inundated in a creek or river flood or its back waters, and suffer not the least bit of damage unless a connection is broken by floating debris. Also a flowing well may be purposely inundated in a lease pond, or pasture stock pond, and have no effect upon the water in any way; whereas it would be impossible to submerge a pumping unit without cleaning up the prime mover and flushing out the gear box after the flood had subsided. Even pumping wells on the jack that have been inundated or covered with flood water must be cleaned up before operation can be resumed.

2. The advantage of a flowing well over a pumping well is also great in rough terrain, in that the flowing well needs no servicing attention in its lifetime; and, consequently, after the well has been drilled, no further thought of lease roads into the well need be given the flowing well. This is especially true in wet weather when roads become impassable for a pulling unit.

3. Operators of both flowing and pumping wells are quite positive in their assertion that oil produced by flowing is much easier and simpler to get in condition to sell to the crude-oil purchaser than is oil produced by pumping. This would follow the credence that most of the cutting in producing oil comes from slippage past the cups, rings, or plunger in the oil-well pump, and is, of course, absent in the flowing well.

Failure or Disappointment in Flowing

To avoid the misconception that flowing is the answer to all water-flood problems, it should be pointed out at this time that there have been some disappointments in flowing. For the most part, the cause was known after the mistake had been made. Otherwise, the mistake would have been corrected as a part of normal operation, and the situation would not have been disappointing. One of the primary reasons for trouble results from gas sands exposed in either or both the injection well and the oil well. If the gas sand is exposed in the oil well, but not in the injection well, the very serious possibility of back-flooding oil into the gas sand in the oil well is present. If the gas sand is exposed in both injection and producing wells, the result will be disappointing—whether the production is pumped or flowed—because too much of the available energy will be uselessly bypassed through the barren sand. Too often the presence of the thief zone is found after many wells have been drilled and completed. The value of preliminary core-testing the proposed area to be developed is especially evident if troublesome spots are detected and eliminated before the misfortune has occurred.

Flowing met with disfavor in a shallow water flood in eastern Illinois when a shale bed or series of shale beds in the producing zone broke down and caused serious, permanent channeling of injection water. Dickey[5] ascribes the break-through to excessive injection pressure. No published data are available to provide information regarding the possibility of success for the project by flowing at lower pressures, but it is the writer's opinion that the project could have been successfully flowed at injection pressures sufficiently low to prevent break-through. This area remains, however, as one in which flowing was rejected in favor of pumping.

Pumping Water-Flood Production

In any discussion of flowing and its merits, pumping seems to receive a lot of unfair criticism, in which the mechanics of pumping have little chance to be defended. An impartial thought on the matter might be expressed by the writer that: "The makers of pumping equipment have not been asleep for the past ten years, but it seems sometimes as though the users had been." Instead of buying equipment large enough to fit the job, or even a little too large, the tendency seems to be to buy it small and cheap, and run it until it falls apart.

In the writer's very limited experience of the past few years, the well-servicing time and expense on water-flood projects, on which pumping equipment large enough for the job was installed, have actually been less frequent and less costly when the wells were running 24 hours per day, and pounding, than it was at the time the same wells were running only one hour per day in the stripper stage. In some 24-hour wells the new equipment has amounted to a new pumping unit, whereas in others the new equipment has amounted to only a new string of rods, and perhaps a new and better traveling valve. Any attempt to do a ten horsepower job with five horsepower equipment will result in an early death for the light equipment, and certain disappointment in the poor job done.

In shallow pools where the crude is of high viscosity, occurring in sand of low specific permeability, there is considerable doubt in the writer's mind that flowing is much more economical than pumping. Because of the shallow depth, the maximum pressure that the formations will stand without break-through is limited. If the viscosity of the crude oil is high, and the permeability of the sand low, every unit of energy available will be needed for lateral movement of oil in the formation, and any energy required for vertical movement in the bore of the producing well will simply be an unfortunate drain on the energy system.

It is not within the scope of this paper to state the limits of permeability or crude oil viscosity which would provide a line of demarcation between water-flood operations which should be pumped and those which may be flowed. In the first place, sufficient data have not been collected by anyone to permit establishment of limits due to the influence of either permeability or viscosity. In the second place, permeability, viscosity, depth, and spacing all enter into the question of economy of flowing over pumping. At a depth of 1000 feet, low permeability is a much less troublesome characteristic than it is at a, say, 500-foot depth, because greater injection pressure can be used at the former depth to overcome the limitation imposed by low permeability. The same holds true for high crude-oil viscosity at greater depth. On the other hand, at a 1000-foot depth the close spacing usually employed at a 500-foot depth would involve considerably greater development cost per acre; therefore, wider spacing would be a choice. At wider spacing, some of the advantage of depth as mentioned previously, will be lost with the smaller number of injection wells employed at greater depth. Therefore, a much more satisfactory procedure for an operator to follow, in attempting to fit his new water-flood project into the picture of pumping vs. flowing, is to depend upon an engineering report by someone with a fund of experience rather than to attempt to consult a permeability-viscosity table to answer the question of whether his water-flood production should be pumped or flowed.

Some water floods in Eastern Kansas are being flowed successfully at depths of 500 feet and greater, in which the crude-oil viscosity is 25 centipoises at reservoir temperature and permeability is as low as 30 millidarcys (by air). There may be other floods being flowed with success in which permeability is lower or viscosity higher, or at lesser

depth, but the data are not available to the writer at this time. The foregoing sand and crude characteristics seem to be the limit at the present writing. The tendency is toward flowing in tighter sand containing oil more difficult to move, but that trend is recommended for those operators who have considerable experience with flowing and who realize the further limitations imposed by lower permeability and higher viscosity.

Use of Old Wells as Flowing Producers

Water-flood operations in which many of the old wells are used for either injection or producer service will probably be more successful by pumping than by flowing. The use of old wells is being resorted to more and more to save capital investment. The old wells leave much to be desired in the way of control, because the records are often lost or in error. Then, too, the old wells were usually shot in a manner quite different from the ideas involved in selective shooting employed at present. The casing is often set high or low in respect to the true sand top, and in many other ways the old wells are a blank so far as information goes in developing the water-flood project. But, primarily, they answer the purpose—often about as satisfactorily as a new hole. But hydraulic control available with delayed drilling is lacking, and this usually means that the producing well will at least begin as a pumping well when used in a water-flood project. There remains, however, the possibility that the old well might begin operation in the water-flood project as a pumping well; and, after a fillup in the sand has been reached, and at a critical time in the life of the pumping equipment in or on the old well, the latter would be converted to a flowing well in preference to the buying of new equipment at a point in the history of the well when added investment would lead to early abandonment. The hope of converting an old well from a pumping well to a flowing well hinges on the possibility of setting a packer successfully at the desired spot in the old hole. Experience gained in flooding sands as deep as 2400 feet, and using old wells for producers, has been sufficient to indicate that it would be possible to obtain the production by flowing if all of the water-input wells were newly drilled. After a fillup has been reached, care must be taken to keep the pumping oil wells serviced promptly; otherwise the oil and water column will build up in the hole quite rapidly, and the production may flow out through the casing head into the gas lines. Or if the hole becomes full during a tubing or rod job, the oil and water will flow out onto the ground. In lenticular sand sections, where permeability may be lower or where the well may be a smaller producer, the fillup may be slower, but is fairly constant with the productivity of the well.

Equipment Used in Flowing Wells

The surface equipment used in flowing water-flood oil wells is very simple and consists of only the necessary valves and fittings to get the production from the tubing or casing of the well into the lead line. A control valve to permit opening and shutting in the well at will is quite necessary, but need be only an ordinary globe or gate valve unless future plans call for operation at pressures above normal. A check valve is also an essential item in the flowing oil-well connections to prevent loss of production from other wells on the lease if a tubing leak should develop in the oil well. A sample cock or bleeder valve is usually another item installed at each flowing oil well to permit taking individual well tests as desired.

Down-hole equipment used in flowing oil wells is usually the same as is used in water-injection wells, except that tubing in the oil well is often, but not always, larger in diameter. If the injection string is 1½-inch tubing, tubing in the oil well may be two-inch. A rag or burlap packer is set at the top of the sand after the oil well has been shot. The packer is cemented in place by dumping a cement slurry into the annulus or by running a temporary extra string of pipe to bottom in the annulus for use as a cementing string. After the cement above the packer has hardened the well is connected into the lead line.

Tubing is almost always run in the water-flood oil wells at depths less than 1500 feet, although some operators are known to cement casing at the top of the sand in shallow operations. In the matter of handling production, especially if any gas is produced with the oil-water mixture, some greater benefit is derived from the gas flowing through tubing than would be obtained by flowing through casing. The disadvantage of tubing, especially on a packer cemented in the well, lies in the difficulties encountered in repairing the string after a leak has developed. If a string of tubing goes bad, it is either removed by a left-hand-thread string of tubing and replaced by better, standard thread tubing; or, if the old tubing is not removed, a pony-packer on a smaller insert string of pipe is run. The latter would, of course, cut down the productivity of prolific well, but is about the only solution if a string of left-hand-thread pipe is not available.

If the flowing oil well is originally equipped to flow, cement-lined pipe may be used for tubing. If the well is equipped to flow, but with the anticipation that it may require pumping at some time in its life, plain pipe is generally run in the hole. Cement-lined pipe seems to be favored over plain tubing in wells in which the packer is cemented in place.

Completion of Flowing Oil Wells

The problems of completing an oil well for flowing are minor if the reservoir pressure has not yet reached the point where the hydrostatic pressure in the oil well is overbalanced. The oil well for flowing may then be completed much the same as a water-injection well. But if the formation pressure has been built up to the point that a fillup in the sand has been reached, the scene may be reminiscent of the "old gusher days."

If the sand has reached 100 percent fluid saturation, the hole will begin to fill as soon as the top of the pay zone has been penetrated. Then, as succeeding lenses or pay streaks are penetrated, the fill-up in the well bore will probably become more rapid; or, if the bore of the well has become full, the well will usually flow with increasingly greater violence. If, after the sand has been drilled, it is desired to shoot the well, that operation must be conducted with the well flowing, after which the well is cleaned out to bottom, and the packer and tubing are run. With the well flowing, it is almost a necessity that the packer be cemented through an intermediate string of pipe to be certain that the cement is properly placed. Until the cement has set, production from the flowing well must be handled in such a way that no pressure is built up in the tubing in excess of hydrostatic. This usually means that the production of the flowing oil well be run into temporary tankage erected at the well for the few days required for the packer cement to harden before the well is in condition to connect into the lead line and begin normal operation.

Flowing and Ultimate Recovery

Because it is impossible to both flow and pump the same lease to depletion, and because it is almost equally as impossible to get a proponent and an opponent of flowing to agree upon the equality of adjoining leases for the sake of comparison, there will probably never come a time when agreement will be reached as to which of the two methods will recover the greater amount of oil under the same conditions. R. C. Earlougher[6] states: "It can be concluded that flowing should not result in a loss of oil recovery, and that flowing can be expected to give as great an ultimate recovery as pumping." Another authority on flowing, B. F. Brundred[7] of Brundred Oil Company, has expressed approval of the case for flowing in another manner: "Where it is possible to inject water at the desired rate, there should be no difference in the daily yield, whether by pumping or by flowing." Thus, if it is the operator's wish to inject water at the rate of five barrels per foot of sand per day, there should be no difference in the rate of production after the void porosity has been filled—if the rate can be maintained under flowing conditions. If, however, the injection rate suffers under flowing conditions, due to low permeability, high viscosity, or the back pressure imposed by the flowing oil well, the rate of production will suffer proportionately.

Objections to Flowing

One of the most commonly heard objections to flowing is that it requires a longer payout than pumping. If the conditions of Brundred's previous statement can be met by flowing, there should actually be less time between investment and payout by flowing than by pumping, because the former requires less capital to do the same work. However, where permeability acts as a bottleneck on the amount of water which may be injected, the back pressure caused by flowing will cause a further decline in intake rate. What would ordinarily require eight years, for example, for depletion by pumping, may require 12 years perhaps by flowing. On the other hand, it is possible to deplete a lease much more thoroughly by flowing than by pumping because of the higher water-oil ratios which may be handled by flowing. Referring again to Figure 1, it may be seen that 30 barrels per day was the economic limit for pumping. The actual cost-vs.-income figures for a few months at that time were available to the writer to show that the lease was not making money at that production rate by pumping. After the conversion to flowing, the daily production fell off, but the lease costs by flowing were so much less than they were by pumping that it was possible to operate the lease at an even smaller rate of production

■ CONTINUED ON PAGE 62

THE USE OF Plugging Agents

By HARVEY T. KENNEDY
Gulf Research and Development Company, Pittsburgh

THIS paper discusses recent developments in the use of plugging agents in secondary-recovery operations. These include the use of various finely powdered solids — such as cement, colloidal clays, and wax distillate— which are added to the water at the input well in water flooding. The use of smokes of various compositions, as applied to gas- or air-repressuring projects, is also discussed.

The plugging of water, which bypasses oil in fields which are not being artificially flooded or repressured, conserves propulsive energy, and allows commercial production of oil that could not otherwise be obtained. It may, therefore, be considered as a method of secondary recovery itself, comparable in importance with repressuring or water flooding. Recent developments in this field are discussed.

(Presented at a symposium on the Development and Operation of Secondary-recovery Projects before the Division of Production at the 26th annual meeting of The American Petroleum Institute, Stevens Hotel, Chicago, November 12, 1946.)

Harvey T. Kennedy

SINCE my last report[1] on this subject there has been continuous impovement in plugging materials and in methods of applying them. Plugging agents serve two main purposes in secondary-recovery projects. They are added to the injection fluid in water flooding and repressuring projects to form selective plugs on and in the sand surrounding the input well. In "watered-out" fields they are injected into the water-bearing portions of permeable formations. Although the function of both treatments is broadly the same, the materials and methods used differ to such an extent that separate discussion of the two treatments is warranted.

Selective Plugging of Gas-, Air-, and Water-Input Wells

The profiles of all pay sands show irregularities which reflect the varying conditions of sedimentation. In alluvial deposits these irregularities may be of very limited areal extent, consisting of small lenses of widely different permeability. In such reservoirs recovery by known producing methods is low. Fortunately, many reservoirs consist of marine deposits in which strata with fairly uniform properties may persist for many acres, and are continuous from input well to producing well. If, in addition to being continuous, the strata are separated by shale streaks which prevent vertical migration between them, two independent paths between the input well and the production well are provided.

Strata of high permeability are responsible for large flush production when wells are first completed. When it becomes necessary to apply water or gas drive, they are quickly flushed out, and thereafter become a liability by short-circuiting the flow system. Because of their high permeability, and because the driving fluid has low viscosity relative to the oil, the greater part of the energy expended in pumping the fluid may be wasted. At the same time tight strata, delivering oil to the producing well, are receiving but a small portion of the injection fluid pumped, perhaps at pressures too low for efficient displacement, because of the excessive total fluid required by the injection well. The net result of this situation is that recovery operations become uneconomic long before all of the layers which make up the reservoir have been subjected to the sweeping action of the driving fluid.

Appreciation of the losses incurred in bypassing and the benefits resulting from control of bypassing have stimulated a great deal of investigation in recent years. A number of patents[2] describing methods of plugging loose strata, without at the same time appreciably affecting the flow into tighter streaks have been issued. Laboratory tests on a number of materials have indicated that a high degree of selectivity is obtainable, and field tests have shown that under proper conditions this selectivity may be attained in practice. The various types of materials and the methods of using them will be described in detail.

Plugging with Solid Particles

One of the first plugging materials employed in the Bradford area was portland cement in very dilute suspension. In this application the hydrating properties are apparently of minor importance, but the distribution of particle sizes is such that a sand of 2550 millidarcys permeability is plugged to the extent of 40 per cent, whereas a sand of 128 millidarcys was unaffected. The selective action is aided by the fact that the looser sand takes more of the suspension and, thus, more of the plugging particles, starting with some 20 times the amount taken by the tight sand. It was found, however, that the plugging effect was due largely to a filter cake on the well wall, which was easily removed and which could not be expected to be permanent in an injection well. By removing the larger cement particles by elutriation, a suspension was obtained which reduced higher permeabilities by plugging pores inside the sand, and which was removed to a lesser extent by backflow. However, the magnitude of the permanent reduction was only 8 percent of the original permeability.

Colloidal clays such as bentonite have been tried in water-flooding experiments, as well as talc, whiting, zinc oxide, and calcium silicate in gas drives, with results similar to those obtainable with unprocessed portland cement. Only on cores with permeabilities considerably greater than those found in producing formations could appreciable plugging be obtained.

Colloidal Solutions

Experience with various plugging materials in northern Pennsylvania has indicated that, for the sands encountered, the materials with very small particle sizes are superior. It is natural, therefore, that colloidal dispersions should be tried, and that results with them should be more promising than parallel results obtained with coarser materials. In laboratory tests colloidal dispersions of wax, properly stabilized with dispersing agents, have been found particularly effective. It is probable that the softness of the wax particles allows them to be distorted in the sand pores, improving their sealing action. Yuster and Calhoun[3] report results on two properties involving 33 wells, in which 17 gallons and ten gallons of wax per well, respectively, were employed. Both properties showed selective action in that their water-oil ratios were appreciably decreased. One property showed a substantial increase in oil production which resulted from an increase in input-water pressure, which in turn was made possible by the decline in water demand by the plugged wells.

K. H. Andresen[4] conducted experiments involving 26 wells in two blocks. He found that large immediate reductions in intake capacity were caused by the addition of three to 15 gallons of various types of wax emulsions to the injection water, but that continued flow caused the intake capacity of the wells to increase until a steady intermediate value was obtained. Further additions had the same effect: each staple value of water-intake capacity was lower than the previous one. Slight selective action was observed in both test areas: water-oil ratios were reduced in one area from 22.2 to 18.3, and in the other from 38.0 to 37.6.

In a report soon to be published,[5] the selective plugging properties of smokes from various sources in gas- and air-injection programs are described. Vaporized resin, stearic acid, paraffin, and ammo-

nium chloride were mixed with, air and the mixture containing very fine condensed particles was passed through sand cores with permeabilities varying from 8 md to 675 md. In all cases greater percentage reduction was observed in the cores of high permeability. Resin smoke showed no effect on a core of 90 md permeability, but reduced the permeability of a 675-md core by 84 percent. With smoke from paraffin, the tighter core was affected to the extent of 50 percent whereas the looser showed a reduction of 98.4 percent. Field tests with paraffin smoke gave inconclusive results.

In summary, it may be said that, whereas much needs to be done in further investigation of plugging methods and materials as applied to gas-, air-, or water-input wells, promising results have been obtained in both the field and the laboratory. The savings in operating cost and the increase in recoverable reserves, which would be brought about by a general solution of this problem, are worthy of a great and continued effort.

Plugging Water Sands in Producing Wells

Well treatments in the East Texas field and Kansas to shut off water are not generally considered as comprising secondary recovery. This is probably because early efforts to stimulate production were applied to fields like Bradford, which have no natural water drive, and the term "secondary recovery" has been accepted as describing fluid injection into reservoirs as practiced in these fields. To accomplish the same purpose in the East Texas field, however, requires plugging of water sands in producing wells instead of fluid injection into the reservoir. If the Bradford field had water conditions similar to those existing in the East Texas field, or if the chronology of the two fields were interchanged, it is believed that the main meaning of the term "secondary recovery" would be synonymous with "water-plugging."

Wells in the East Texas field, with the exception of those located on the eastern edge of the field, decline and are abandoned because of excessive water production rather than because of reduced oil producing capacity. This is true in western Kansas, Seminole, and a number of other important oil-producing districts. It would seem that the only general method of extending the commercial life of wells of this type consists of treatment to reduce their water production.

The appearance of water in a well entails a number of serious problems. As water carries much less gas in solution and is heavier than oil, flowing wells decline in production and later must be pumped. With limited pump capacity, the necessity of lifting excessive water frequently makes it impossible to pump as much oil as the well will produce, or is allowed to produce under proration. Means must be provided for disposal of the water in most fields, and this is generally a costly undertaking. Corrosion and emulsion troubles frequently begin.

One of the most serious results of producing large quantities of water along with oil is the least appreciated. This effect is the drop in pressure of the water which forces the oil into the well. It has been shown that high recoveries in water-flood operations are dependent on high-pressure gradients.[6] The dissipation of water pressure before the stripping stage is reached precludes the possibility of the employment of high natural pressure gradients when they are most needed.

Several excellent accounts[7, 8, 9] of plug-back operations in various areas have appeared recently. Treatments of the types described have been employed on an increasing number of wells with continued favorable results, using a chemical resembling bakelite in its properties. Most wells require only small volumes of resin for effective shutoff, averaging about 30 gallons per well. In addition, treatments on a considerable scale have been carried out in several other areas.

In Kansas 88 treatments were performed by one company in the first five months of 1945. Although many of the treatments were highly successful, it is impossible to rate the percentage of success as has been done in the East Texas area: first, because all the data are not available to the writer; and, second, because of the varied purposes of the jobs. The information is sufficient to indicate that the several limestone formations producing in Kansas may be plugged completely, notwithstanding their more open texture and the fact that most wells have been heavily acidized.

In the year ending March 1, 1945, 88 treatments were performed in the Houston district by one company. Jobs which were entirely successful in achieving their purpose and those which accomplished less are about evenly divided. The somewhat lower percentage of success, as compared with the East Texas field, is no doubt due to the relative lack of information of the many sands in the coastal region.

Many of the early water-plugging treatments were applied to wells that had reached the stage of abandonment. Oil recovered from such wells after treatment may be considered as obtained by secondary-recovery methods. At present, there is a tendency to plug water shortly after it makes its appearance. In such cases, the oil recovered by secondary methods is indeterminate—much as it is when pressure maintenance, rather than gas drive, is applied.

Acknowledgment

It is a pleasure to acknowledge the author's indebtedness to Paul D. Foote and B. B. Wescott, for suggestions and for permission to publish this paper; to P. E. Fitzgerald, of Dowell Incorporated; William D. Owsley, of Halliburton Oil Well Cementing Company; S. T. Yuster, School of Mineral Industries, The Pennsylvania State College; and Kurt H. Andresen, South Penn Oil Company, for field and laboratory data used in this paper.

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Flowing Water-Flood Production

■ CONTINUED FROM PAGE 58

and still make money. In the 48 months since the lease illustrated in Figure 1 was converted from uneconomical pumping to profitable flowing, it has recovered for its owners an additional several hundred barrels of oil per acre that would otherwise have been lost in premature abandonment of the pumping project.

Flowing and Deeper Water-Flood Operations

Earlougher[6] also concluded in his paper that permeability and depth are probably the controlling factors in determining the solution of whether to pump or to flow. The writer would limit the main factor to permeability alone, unless by depth Earlougher means that certain very shallow water floods should be pumped if excessive pressure for the depth is required to provide flowing energy. Even in water-flood operations as deep as 2800 feet, the reasons for not flowing are either directly or indirectly due to low specific permeability. Because of the spacing requirements, due to usable wells already drilled, or the economics of wide spacing and the smaller capital cost per acre, sufficient energy (as barrels of water per day) cannot be put into an injection well without resorting to higher pressures. Therefore, the more conventional form of water flooding is being applied in the deeper sand areas up to the present time. It remains, however, just as it did 10 years ago in the shallow water floods, for someone with vision and patience to develop a deeper water flood and flow the production. If the water-injection rates can be maintained with higher pressures, an entirely new horizon of deep, depleted gas-expansion fields will be opened to secondary recovery; and flowing will become as much a part of water flooding as water-injection itself.

Acknowledgment

The writer wishes to acknowledge the contributions of R. C. Earlougher of Earlougher Engineering, Tulsa; D. P. Oak of Lynde, Walters, and Darby, Tulsa; R. B. Bossler of the Brundred Oil Corporation, Ottawa, Kan., and Oil City, Pa.; Paul D. Torrey, Dallas, and many others who offered criticisms and suggestions. The permission of The Ohio Oil Company to publish this paper is also gratefully acknowledged.

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[2] R. V. Hughes, personal communication.

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[4] Frederick Squires, "Flood Tide in Illinois," Producers Monthly 10 [9] 10 (1946).

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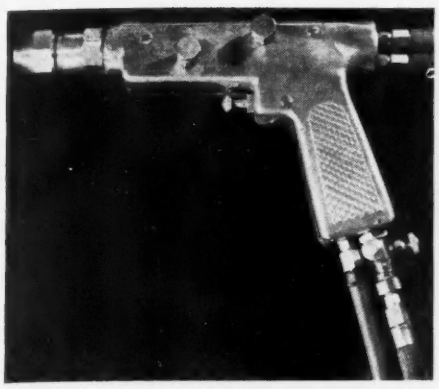
[7] B. F. Brundred, personal communication.

NEW EQUIPMENT LITERATURE

For additional information, use mailing card inserted opposite this page

1—Gun Spraywelder

A gun spraywelder is being manufactured for use in spraying powdered alloys in thin layers by the use of a small, light pistol-like gun. Action of the spraywelder is similar to that of oxy-acetylene welding, in that both oxygen and acetylene are required to produce an intense flame at the nozzle of the gun to melt the powdered metal which is fed into the spraywelder by compressed air.



The surface to be metal-sprayed is sand-blasted and a thin coat of alloy sprayed on (not to exceed 0.060 inches in thickness). The metal coating is then fused into the body of the sprayed surface by either the regular oxy-acetylene methods, induction heating, or by controlled atmosphere furnace. This produces a molecular or fusion bond between the two metals. The finished surface may be polished or left as sprayed, the latter being a smooth, dull finish. A metal hopper is furnished with two connecting hoses. The powdered metal alloy, Colmonoy No. 6, is fed into the gun from the hopper by means of the compressed air.

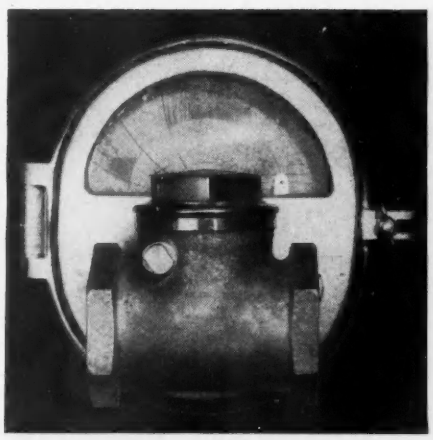
Manufactured by Wall Colmonoy Corp., Fisher Building, Detroit 2.

(Check item 1 on postcard for more information.)

2—Automatic Recorder

A new automatic recorder of oil well performance provides a permanent minute-by-minute record for pumping wells. It is relatively simple to install on any part of the line between the stuffing box and the lease tanks or sumps, and is said to furnish permanent records by the day or by the week. The PSJ recorder is claimed to detect and record any change of stroke, plunger or tubing trouble, to indicate when the well should be bailed, show experimental work fluctuations, indicating the exact time and length of such fluctuations, the approximate total volume and comparative volume of fluids produced. The time spent in servicing a well is charted and permanently recorded.

The recorder requires no ink and is adapted for either one-inch or two-inch connections. Ruggedly constructed of cast aluminum, the case is attached to a standard swinging gate, 125-pound, two-inch check valve. It contains mechanical linkage from the stylus which measures and records the gate position on a 24-hour or seven-day wax-surfaced chart, which is turned by a hermetically-sealed Macknic chart clock. Offered by E. E. Jones, 201 E. Moreta St., Bakersfield, Calif.

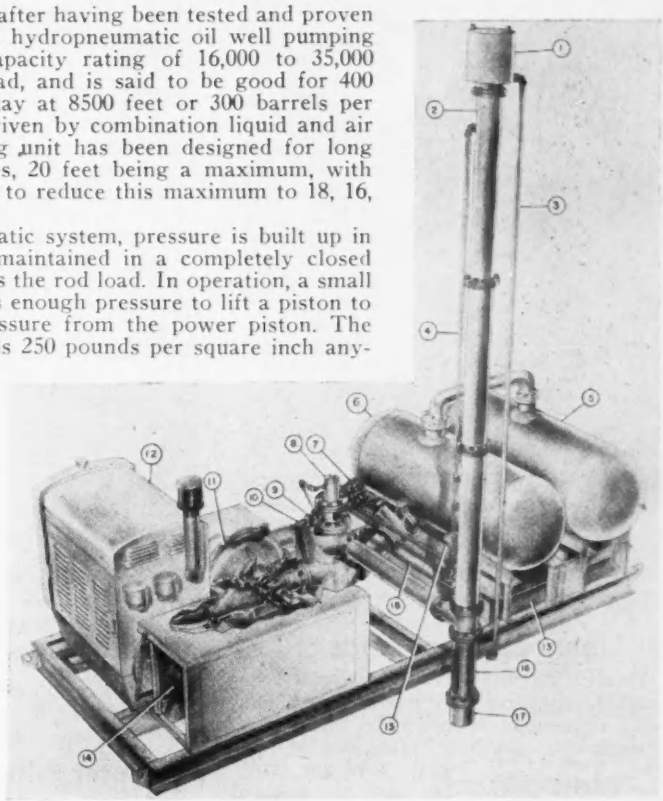


(Check item 2 on postcard for more information.)

3—Pumping Unit

Now in production after having been tested and proven for service, is a new, hydropneumatic oil well pumping unit which has a capacity rating of 16,000 to 35,000 pounds polish rod load, and is said to be good for 400 barrels of fluid per day at 8500 feet or 300 barrels per day at 10,000 feet. Driven by combination liquid and air pressure, the pumping unit has been designed for long constant speed strokes, 20 feet being a maximum, with adjustments provided to reduce this maximum to 18, 16, 14, 12, or 10 feet.

In the hydropneumatic system, pressure is built up in an accumulator and maintained in a completely closed system which balances the rod load. In operation, a small centrifugal pump adds enough pressure to lift a piston to add or withdraw pressure from the power piston. The pressure never exceeds 250 pounds per square inch anywhere fluid velocities are controlled. The power stroke is synchronized with the rod-stress wave modulation to further eliminate rod impact and reduce fatigue. In case of a rod break, power failure or any other interruption of service, the piston of the pump rises to the top of the cylinder and remains there until the trouble has been corrected.



The entire unit is mounted on skids to facilitate portability. Power may be furnished by a variety of prime movers, including fuel oil, butane, propane, gasoline or electricity.

Figures in the illustration refer to functional parts of the pump which are: 1, cylinder cap; 2, cylinder; 3, overflow line; 4, control line; 5 and 6, tanks; 7, shutoff valve; 8, 9, and 10, chest valve assembly; 11, pump; 12, engine; 13, tank; 14, pulley; 15, regulator; 16, spool; 17, adapter; and 18, control line.

Manufactured by the Oil Well Equipment Division, Harvey Machine Co., Inc., 6200 Avalon Blvd., Los Angeles 3.

(Check item 3 on postcard for more information.)

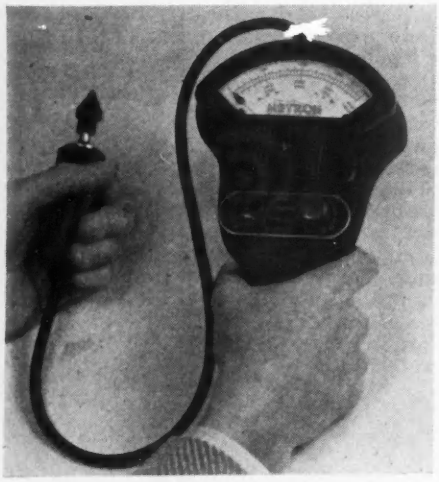
4—Tachometer

Type 25B tachometer measures rotative speeds down to ten revolutions per minute. Consisting of two units, the head and indicating unit, the tachometer has three speed ranges of 10 to 200, 20 to 400, and 50 to 1000 revolutions per minute. Any of these ranges may be selected by turning a knob on the indicating unit.

The spindle extending from the tachometer head rotates a multi-blade, make-and-break switch, which acts similar to a double-throw, double-pole switch. For this reason, the direction of spindle rotation does not affect measurements. The spindle head is connected in series to a battery source and a sensitive milliammeter. Oscillations of the switch blades alternately charge and discharge condensors which cause a flow of current through the milliammeter. The flow of current is proportional to the speed of the spindle.

Accuracy of the tachometer is claimed to be 1 percent of full scale reading. The head contains only one rotating part,

which is mounted in permanently lubricated ball bearings. It is supplied complete with a carrying case containing contact tips and discs for measuring linear velocities. Low and high speed

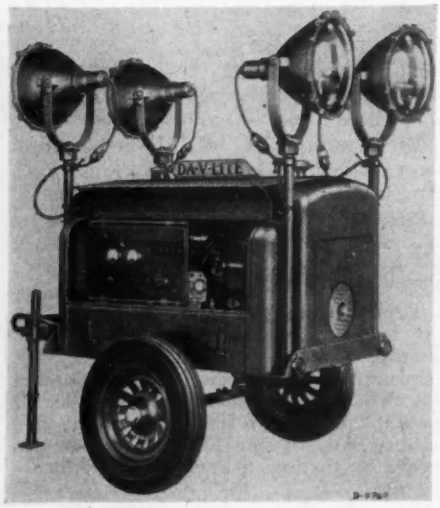


adapters are available to extend the range down to 1 and up to 10,000 revolutions per minute. Manufactured by Metron Instrument Company, 432 Lincoln Street, Denver 9.

(Check item 4 on postcard for more information.)

5—Lighting, Power Units

Production of four new Da-V-Lite portable lighting and power units has been announced. These units have been designed to provide light and power when and where needed, and are built



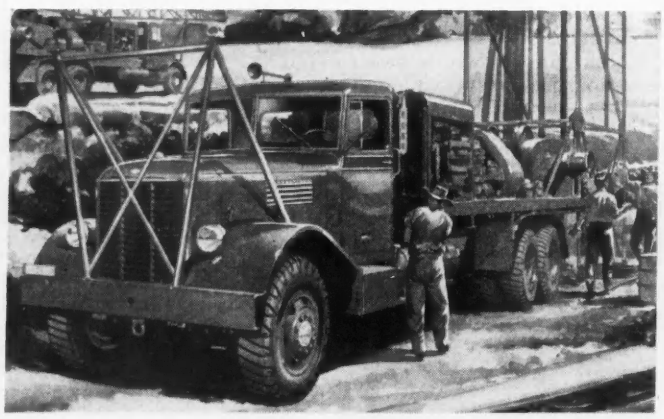
around a 5000-watt Westinghouse self-excited, self-regulated alternating-current generator driven by a 15 horsepower, four-cylinder Wisconsin air-cooled engine. These units are available in skid and two-wheel spring trailer mountings. Trailer machines are 9 feet long, 7½ feet high and 5 feet wide, weighing approximately 1750 pounds. The floodlight models are equipped with four heavy-duty Westinghouse 16-inch floodlights, providing 185,000 candlepower per light.

Manufactured by Davey Compressor Company, Kent, Ohio.

(Check item 5 on postcard for more information.)

6—Heavy Duty Truck

Model W-6564-OH truck is a 65,000-pound gross weight vehicle with a tandem drive axle for heavy duty on or off the highway. The unit shown here is equipped with a portable drilling rig for which it is especially adapted. It is one of six new trucks ranging from 30,000 to 90,000-gross vehicle weight rating and powered by a choice of two gasoline and three diesel engines. Special equipment is provided for both gasoline engines to permit the use of butane fuel. Optional equipment also includes a choice of eight heavy-duty transmissions of 4-, 5- and 10-speed types and four 3-speed auxiliary transmissions of either the direct or overdrive type. The chassis is also available in two types of tandem drives, both especially adapted to off-highway service.



This 6 by 4 (a six-wheel vehicle which drives on the four rear wheels) truck is displayed with an International-Continental S-6749 gasoline engine which develops 254 brake horsepower at 2600 revolutions per minute and 585 pound-feet of torque at 1400 revolutions per minute. It is a valve-in-head type with 749 cubic-inch displacement. Other engines available are the Cummins Diesel HB-600, NHB-600, and NHBS-600 (supercharged), and the Hall-Scott HS-400 (gasoline).

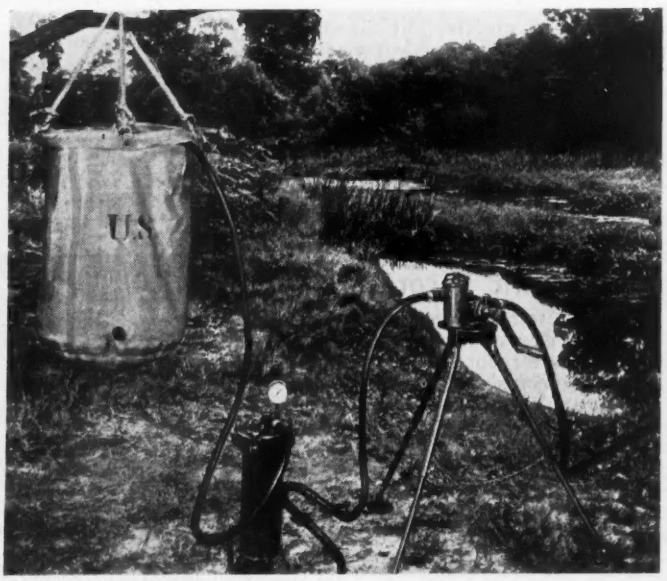
All units are equipped with air brakes, front and rear standard disc-type wheels. The rear axle of one model is Timken's SD-466 double-reduction, tandem-drive type with a gear ratio of 8:15 to 1.

Manufactured by the Motor Truck Division, International Harvester Company, 180 N. Michigan Avenue, Chicago 1.

(Check item 6 on postcard for more information.)

7—Water Filtration Unit

%Proportioneers, Inc.%, Providence, R. I., has announced a new, hand-operated water filtration unit, rugged in construction and portable for use on construction jobs or in camps remote from ample supplies of clean water. The system is capable of delivering two gallons of filtered water per minute and weighs approximately 55 pounds. Constructed of corrosion-resistant materials, the hand Pur-O-Pumper has two principal parts: (1) the pumping and treating unit, and (2) the filter section.

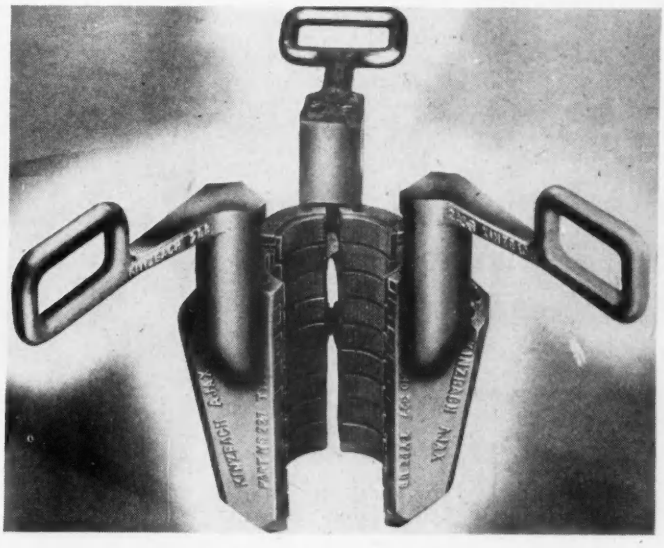


The first consists of a self-priming, synthetic rubber-vaned impeller, rotary displacement pump made of bronze with the impeller mounted directly on the extend crankshaft. The pump is mounted on a tripod to facilitate hand operation. The filter unit is a stainless steel tank five inches in diameter and equipped with a pressure gauge, precoat feeder and connections. The tank contains a cylindrical aluminum oxide filter stone mounted directly on a cast filter cover. It is on this stone that the diatomaceous earth is deposited. The tank itself has a conical bottom with a foot valve to facilitate the discharge of sludge when backwashing. Water from the filter unit is collected in a Lyster bag or other container and purified by addition of tablet of calcium hypochlorite.

(Check item 7 on postcard for more information.)

8—Slips

Recently introduced, Type U-B Unit Slips are designed to support strings of all popular size API drill pipe being used in today's drilling. Four individual segments, connected by a unique hinging arrangement, provide greater flexibility and more even distribution of pipe weight. Each segment aligns independently around the pipe and carries its proportionate amount of weight. Nine separate, broad-faced inserts in each segment provide for unconformities in pipe walls and insure true contact. Ample fluid drain-back is provided. Broad cored backs eliminate cutting of master bushings, yet will not stick under the heaviest loads. A new handle design keeps the operators' hands clear of the rotary table and elevators and provides better balance for easier setting and picking up of the slips.



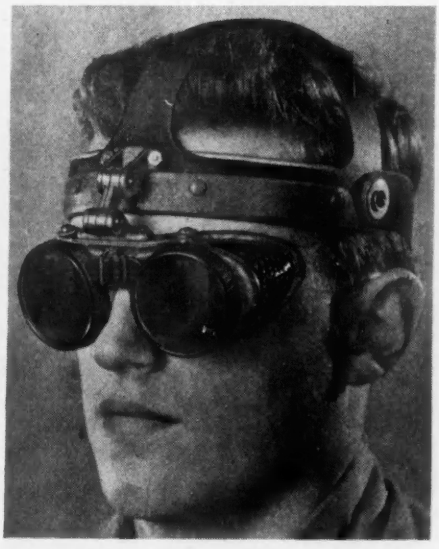
One of the outstanding features is that, through interchangeable segment inserts, several sizes of pipe can be handled with one set of slips. Inserts are easily removed and replaced on the derrick floor.

Manufactured by Kinzbach Tool Company, 2418 Winter Street, Houston.

(Check item 8 on postcard for more information.)

9—Welding Goggle

A new head-rest welding goggle which can be instantly thrown into "off guard" position for rapid inspection of setups was recently introduced. Developed to eliminate waste motion and speed up welding operations, the goggle is attached by a friction joint to a comfortable head-gear assembly. Using only one hand, the welder is able to flip the goggle above his eyes, where it is held securely by the friction joint to provide complete, unrestricted vision.



Adjustable for individual features, the goggle is equipped with opaque eye cups specially designed for wearing directly over eyes or over personal prescription glasses. It also has indirect, ventilated side shields which keep out stray light rays, sparks and metal splashes, yet provide ventilation to reduce fogging. The goggle is available with either Noviweld or Noviweld-Didymium lenses in certain shades.

Manufactured by American Optical Company, Southbridge, Mass.

(Check item 9 on postcard for more information.)

Literature

10—Power Shovel

An informative 36-page catalog has been published on the Buckeye convertible power shovel known as the "Clipper." The advanced features of this unit are pictured and described in detail, including vacuum power control, non-clogging crawlers, balanced weight, and fast, positive crowd, hoist, swing and travel.

Also illustrated and described is the quick and ready convertibility from a power shovel to trench hoe, dragline or crane, clamshell, hook block or magnet pile driver.

Published by Buckeye Traction Ditcher Company, Findlay, Ohio.

(Check item 10 on postcard for more information.)

11—Hoses

A new catalog leaflet describes oil suction and discharge hoses designed for use in refineries and distributing terminals, on oil tankers and barges, for loading and unloading, to conduct oil and gasoline from sea lines to tankers, pontoon work, and other services where flexible connections are needed. The leaflet (Catalog Section 4100) pictures and describes the various types of oil hose for this type of service, and outlines particular applications for which each is designed. Data on types and sizes are listed.

Released by The B. F. Goodrich Company, Akron, Ohio.

(Check item 11 on postcard for more information.)

12—Valves

Bulletin 461, with 20 pages illustrated in color, gives engineering operating and maintenance data on pressure reducing valves, differential valves and overflow valves for steam, air or gas services. Large cross-sectional and external views of each class of regulator are shown, together with construction details, exclusive features such as stellited seat rings, and complete tables of pressure ranges, sizes, and capacities.

A handy, easily read "ready-reference" index chart at the front of the bulletin simplifies selection of the best valve for any specific industrial application, including steam supply to air ejectors, dye tanks, kettles, etc. Recommended installations are shown and discussed for remotely adjusted valves, valves with internal ports, and valves designed for external control. Approved methods of grinding main valves, tightening controlling valve seats and checking controlling valve stem clearance are described pictorially, with complete information for dismantling, cleaning and assembling.

Released by Leslie Company, 167 Delafield Ave., Lyndhurst, N. J.

(Check item 12 on postcard for more information.)

13—Pipe Chart

The new "Chart of Pipe and Fitting Materials" deals with carbon, intermediate alloy, stainless and special analysis steels, and covers ASTM specifications, chemistry, service limitations and welding procedure. The nine by 14-inch chart folds to 8½ by 11 inches, and fits into a standard letter-size filing cabinet. Prepared by the Engineering Service Department, Tube Turns, Inc., Louisville 1.

(Check item 13 on postcard for more information.)

14—Gauges

"Marsh Gauges . . . Built for the Oil Industry," is the title of a catalog describing pressure gauges designed for mud pumps, boilers, Christmas trees, hydraulic applications and general service. The two-color brochure is illustrated and specifications are given for each gauge.

Brief, pertinent descriptions of each gauge presented give outstanding characteristics which make them adaptable for the service specified.

Released by Jas. P. Marsh Corporation, 2073 Southport Avenue, Chicago 14.

(Check item 14 on postcard for more information.)

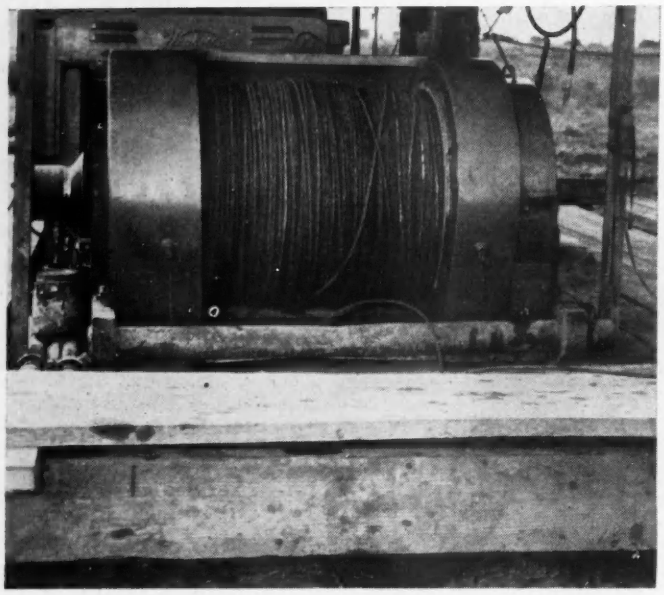
15—Tank Trailers

A 12-page, two-color brochure contains photographs of tank featherweight trailers in several industrial applications. New features incorporated into the chassis are described and illustrated. Of particular interest is the torsion spring shackles which are connected to load equalizers. Exclusive features are presented along with various applications.

Published by Fruehauf Trailer Company, Detroit 32.

(Check item 15 on postcard for more information.)

Unitized Sand Reel Mounting



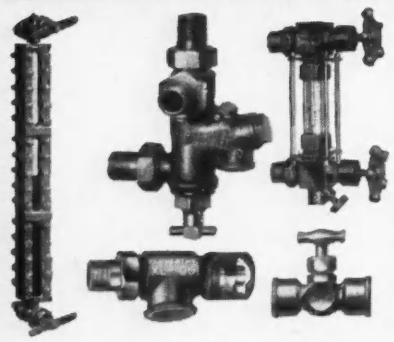
AUXILIARY EQUIPMENT

By using slightly heavier beams for the base of this auxiliary unit skid, one contractor also provided a most satisfactory setting for the sand-line reel and its accompanying driving unit. The reel is mounted in one end of the skid, and the skid then aligned so the line may be brought into the derrick without fouling other equipment. A steel cultivator seat, mounted to one side of the reel, places the operator where he has a full view of the operations at the rig, yet he is sheltered by the roof of the skid against inclement weather, and also against glare of the sun which, on an open mount, occasionally is the cause of overrunning a line or other mishaps.

Addition of the sand line and its power unit to the compressor, electrical generating equipment and water-supply pump brings the total weight of the unit to 33,000 pounds. The entire unit is so constructed, however, as to be self supporting as it is winched onto a trailer for transportation, and the additional protection given the reel and power unit by the skid mounting extends the interval between overhauls to a degree which more than pays for the heavier skid required for the setup.

$5.00 is paid for each illustrated acceptable contribution. Mail to The Editor, THE OIL WEEKLY, P. O. Box 2608, Houston 1, Texas

PENBERTHY
QUALITY
PRODUCTS



Penberthy liquid level gages of various types—injectors—ejectors—all so widely used throughout the oil industry because they have always been dependable under the most severe service conditions.

All are of rugged construction and made by an organization with 57 years experience in the manufacture of quality products.

See Pages 2450 to 2455, Composite Catalog

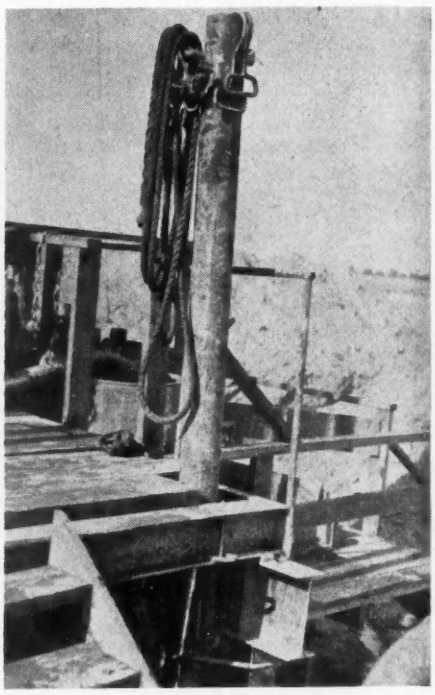
PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

Pipe Rack Base

One of the disadvantages of using soft rope and steel cable to construct a matting on which the drill pipe stands are racked on the derrick floor, lies in the fact that when it becomes covered with mud or oil, the slippery material remains with no provision to drain until it is sluiced off with a water hose. One drilling company improves this situation by using three-inch planking material mounted edgeways, small blocks providing proper spacing between the material as illustrated. Ample strength is contained in this type of installation, with drill pipe less likely to crush or scar the timber matting. It has the advantage also of being at least partially self-draining, fluid being permitted to run off and thus keeping the mat cleaner and correspondingly safer for the man on the derrick floor who is racking the pipe.

PIPE RACKING

Telescoping Backup Post

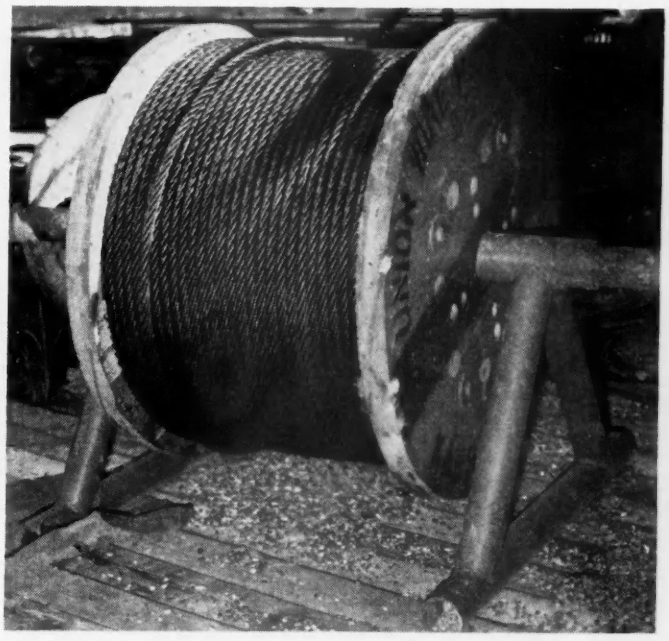


BACK UP POST

Considerable time is saved on rigging up portable drilling rigs by the system devised by one company for a backup post on the rig floor. Instead of the conventional triangular post which usually is bolted down or otherwise secured to the flooring, this method utilizes only a length of 6⅝-inch casing telescoped vertically inside a length of 8⅝-inch pipe. The latter section is permanently secured to the side of the derrick floor corner supports and may be moved along with the rig as a permanent fixture.

When the rig is being assembled at the location, the much-needed backup post may be readied within a few seconds merely by dropping the upper section into place. Provided with an eyebolt for securing backup lines, the post is amply sturdy for all routine backup work.

Simplified Cable Reel Support Sturdy, Efficient



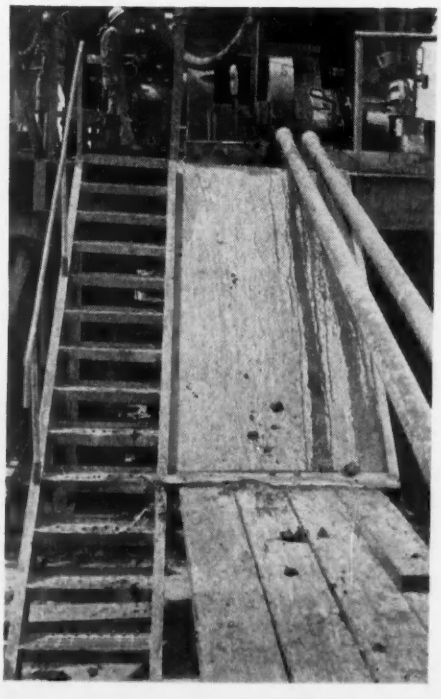
WIRE LINE HANDLING

One drilling superintendent utilizes a support which requires but four short lengths of four-inch pipe, the three longer pieces being welded into a triangle, with the fourth welded across the vertex and at right angles to the plane of the triangle. The base member is approximately as long as the diameter of the reel, the two side pieces long enough to bring the bearing member high enough so that the reel will clear the ground, and the transverse section about 12 inches long.

A section of 3½-inch double extra strong pipe, about twice as long as the width of the reel, is thrust through one support, then through the reel, and finally through the other support. The long base member gives desired stability in line with the sides of the reel, while overturning or sidewise collapse is resisted by the 3½-inch pipe serving as axle, spindle or shaft.

Supports such as those shown require a minimum of truck space when on the move, will furnish adequate support for the heaviest reel on uneven supporting surfaces, and are light enough to be handled by one man while the reel rests on the bed of the truck. The spindle and both supports are placed in position before the reel is unloaded, the sling being passed around the projecting ends of the 3½-inch pipe, leaving the supports free to be aligned as the load descends.

Floor Ramp and Stairway Unitized



RIG WALKWAYS

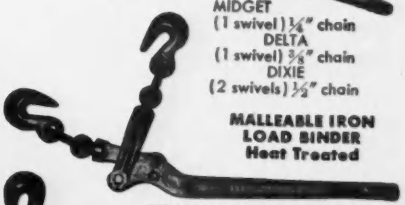
Both sides of the steel beam used for one side of the stairway to the derrick floor on the pipe rack side are utilized by a contractor who welds one edge of the heavy sheet used as a ramp to the center of the web of the beam. The beam then serves as one side of the ramp, while a section of two-inch pipe, welded along the other, prevents wandering of the pipe at that side. The ramp is equipped with a horizontal projection at the bottom, which rests on the timbers of the walkway, and which may be spiked or bolted to them if necessary to provide greater rigidity than if the walk merely supports the lower end of the ramp.

At the top of the ramp, the plate is bent over at the correct angle to overlie the derrick floor, thus preventing possible hanging up of the tool joint as it slides off the ramp onto the floor.

Stair and ramp are readily handled as a unit when tearing down or erecting the rig at a new site. Due to the reinforcing along one edge, the plate will withstand severe service.

LOAD BINDERS

SMOOTH HANDLE STEEL LOAD BINDER
PAT. PENDING



MIDGET (1 swivel) ¼" chain
DELTA (1 swivel) ⅜" chain
DIXIE (2 swivels) ½" chain
MALLEABLE IRON LOAD BINDER Heat Treated

LONE STAR No 1—141 lbs. (2 swivels ½" and ⅝" chain
LONE STAR No. 2—161½ lbs. (2 swivels) ½" and ⅝" chain
DROP FORGED LOAD BINDER Heat Treated

No. 1—101 lbs. (2 swivels) ⅜" and ½" chain
No. 2—171½ lbs. (2 swivels) ½" and ⅝" chain

STEEL CONSTRUCTION WIRE STRETCHERS

No. 3—3 Pulleys, plain bearings, ⅜" rope
No. 33—3 Pulleys, roller bearings, ⅜" rope
No. 4—4 Pulleys, plain bearings, ⅜" rope
No. 44—4 Pulleys, roller bearings, ⅜" rope
No. 88—4 Pulleys, roller bearings, ½" rope

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Manufacturers of Certified Specialties
Drop Forged and Malleable Iron
6611 OLIVE ST. ROAD — ST. LOUIS 5, MO.

Lifts 25 Tons
10¼ Inches
P.D.Q.

No. 2522; Capacity 25-tons; height 22"; lift 10¼".

No. 2522 Simplex Standard Speed Jacks are generally used in pairs by drillers and riggers for heavy lifting and lowering; pulling casing moving derricks, draw works, field boilers, etc. Combines power with high lifting range. Mechanism is at top of Jack and large toe lift is 4⅜" from ground level in minimum position.

Simplex
LEVER SCREW - HYDRAULIC
Jacks
Templeton, Kenly & Co.
Chicago (44), Illinois
Better, Safer Jacks Since 1899

. . . but not when you are cementing casing in a well

That's one time to take every possible precaution, and the simplest, surest, low-cost method you can follow is to use Baker Casing Centralizers on the shoe joint, and on a joint or two above. The casing is centered in the hole so that cement slurry can get all around it, and you know the odds are with you to get a sound "first-time" cement job. Call any Baker man and he will see that you are supplied promptly with . . .

BAKER CASING CENTRALIZERS

FITLER LUBRICORE

There is but one genuine "LUBRICORE" Self-Lubricating Rope made and placed on the market by FITLER, patented by FITLER and easily identified as a FITLER product by the Self-Lubricating "Green Yarn Center."

Insist on "LUBRICORE" — Beware of imitations — Don't accept substitutes. Ask for "LUBRICORE," the Self-Lubricating Green Yarn Center Pure Manila Rope made by FITLER.

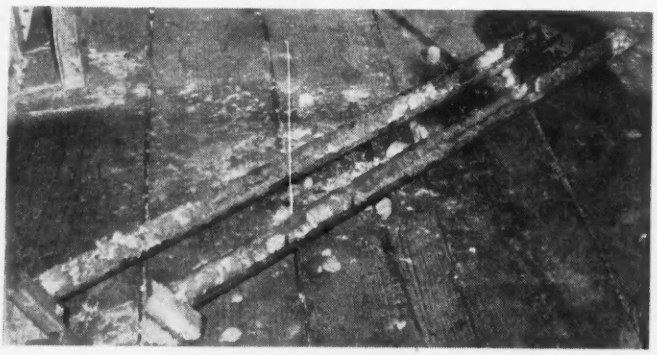
★

THE EDWIN H. FITLER CO.

PHILADELPHIA, PA.

Manufacturers of Quality Rope Since 1804

Core Holders Made From Pipe Facilitate Inspection



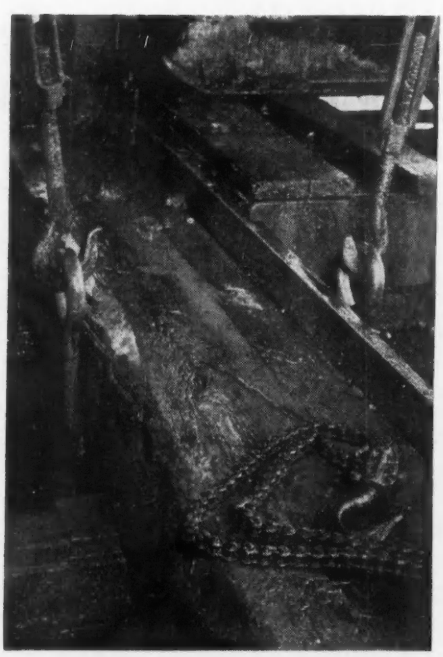
CORE HOLDERS

Much valuable subsurface information may be lost if the core is not carefully handled from the time it is removed from the core barrel until it reaches the laboratory. One drilling company insures proper care of the core by providing special racks into which the core is extruded or in which it is laid piece by piece as it is recovered. The racks are made of longitudinally split two-inch pipe in five-foot lengths. Each section is provided with 2 x 2-inch angle ends, six inches in length, welded across the open end of the half pipe. These ends serve to hold the unit properly to receive the core, and also as stops to prevent loss at the ends.

The bottom of the five-foot pipe section is perforated at two-inch intervals with ¼-inch holes, so that any water may drain from the cores, or so that water may be flowed over them to wash away entrained drilling mud. When the core is to be examined on the spot, two five-foot sections will care for recoveries from a ten-foot core barrel. If the cores are to be transferred to the laboratory, two more sections are used as covers, in effect completing a two-inch pipe around the cores. The adjacent angle-iron ends are tied with twine or marline to prevent chafing of the cores.

Between periods of use, the holders are readily hosed out, and may be stored in the angle of the derrick.

Engine Tie-down Anchor Serves Dual Purpose



ENGINE TIE-DOWNS

Attaching the tie-downs used to prevent shifting of the drilling engine on its base usually involves use of the sills on which the derrick is supported, as in this manner the derrick legs resist the tension exerted through the turnbuckles in the system.

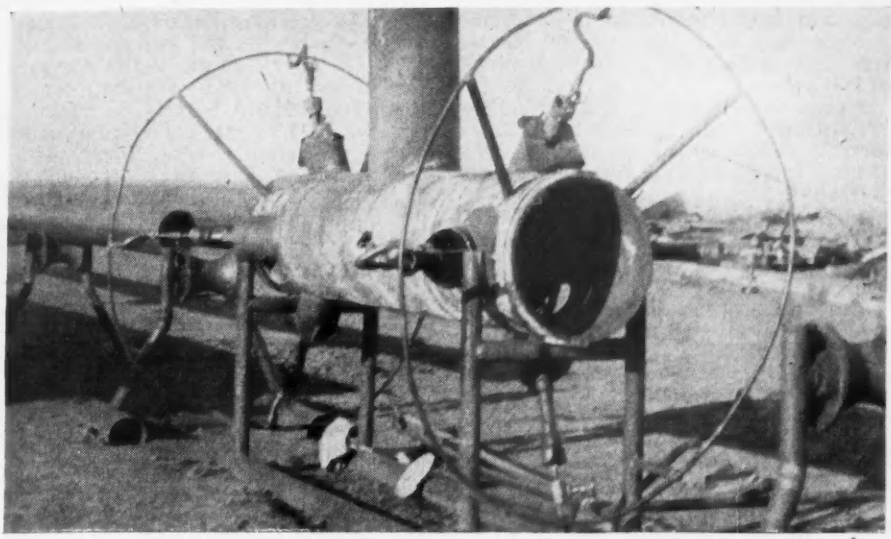
One contractor provides a rigid attachment for the lower hooks of the turnbuckles by setting a squared "U" of 1¼-inch steel around the two 12 x 12-inch timbers forming the sub sill of the rig. The U-shaped unit is formed to fit snugly around the two timbers, and thus serves a dual purpose by preventing their spreading or shifting, as well as preventing the lower portion of the turnbuckles from revolving as slack is taken up on the paired threads and the desired tension applied.

The round rod does not cut into the timbers as does the drilling chain sometimes used as anchor and, being in one piece of new material, does not possess the breakage hazard which is present in old chain which, under severe shock, may fracture and release the anchored unit. The U-shaped retainer may be temporarily blocked up into place until tension is obtained through the turnbuckles, after which the blocking may be removed. This tight bind between the sub-sill members adds strength and rigidity.

$5.00 is paid for each illustrated acceptable contribution. Mail to The Editor, THE OIL WEEKLY, P. O. Box 2608, Houston 1, Texas

PIPE LINE HINTS

Fabricated Burner Descales Salvaged Pipe



PIPE CLEANING

For removing protective bitumastic enamel and other extraneous material from reclaimed second-hand pipe, to aid close inspection and facilitate spot welding of pit-holes, one pipe line company with an abundance of natural gas available at the pipe yard, devised a burner for the job.

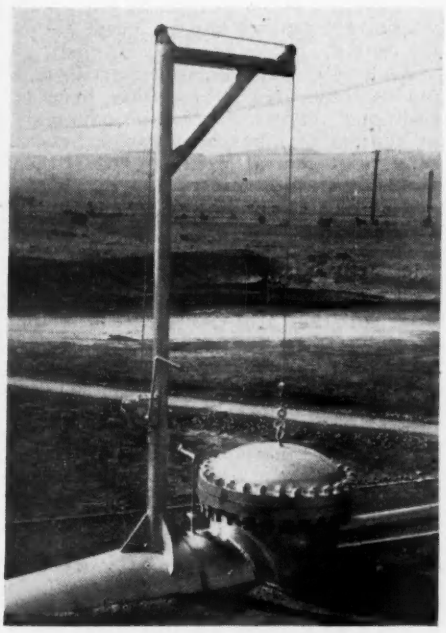
The main barrel of the burner is an eight-foot length of 16-inch pipe, with an upright flue made from a four-foot length of 12-inch pipe welded to its mid-length point. Eight inches from each end of the main barrel, four six-inch holes, spaced at 90-degree intervals around the circumference of the main barrel, were cut. Into each of these holes (four on each end) a short length of six-inch pipe was welded at an angle of 45 degrees with the longitudinal axis of the main barrel. Into each of the 45-degree openings, a single-jet gas burner was fitted.

At each end of the main barrel, a circular ring five feet in diameter, made of ½-inch pipe and held in place by two spoke-like supports, conveys gas to the set of burners on each end.

Each burner is connected to the five-foot-diameter circular ring supplying the gas by a short piece of flexible rubber hose. Each burner is fitted with a gate valve and adjustable air-mixing chamber, similar to those on the conventional gas-burning kitchen range, so that proper combustion and a maximum of heat can be obtained.

The entire unit is supported at a convenient height on a rectangular welded frame assembled from scrap pieces of two-inch and three-inch pipe.

To remove the undesired enamel from a joint of pipe, the eight burners are lighted and adjusted and the pipe to be processed is passed lengthwise through the barrel of the burner.



Hoist Eases Flange Lift

FILTER CLEANING

In order to speed and greatly facilitate the frequent task of opening and closing a large pipe line filter box, a station foreman designed and installed a simple overhead, crank-operated hoist mounted permanently over the installation. Designed for operation by one man, the framework of the support is of three-inch pipe and is nine feet tall. The two-foot overhanging arm is well braced and has welded at either end a small sheave to accommodate the light wire line used on the hoist. The upright is welded to the upper surface of the pipe line itself, four small wing fillet braces being welded to the base to add more rigidity. A simple reel and cog wheel welded to a bracket on the side of the pole provides ample leverage for the removal and replacing of the heavy filter box cover by one man.

Anywhere!

Buckeye Trenchers minimize right-of-way work. Dig in any soil. Ruggedly constructed. Faster. Readily maneuvered. Model 12 (shown) for gathering, gasoline and small natural gas lines. Models 32 or 48 for main lines. The standard trenchers for pipeline work.

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TRENCHERS, SHOVELS, CRANES
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PIPELINE "Know-how"

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SMITH CONTRACTING COMPANY
ODESSA, TEXAS

MAIN BUSINESS OFFICE
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Crude Production, Refinery Output Show Slight Gains

Crude production in U. S. fields increased slightly in the week of November 9, as did refinery output of all principal products, according to the latest report of the American Petroleum Institute.

Stocks of gasoline and distillate fuel oil continued to accumulate, due to the prevailing mild weather throughout most of the nation, a condition that has held back the ordinary drop in gasoline consumption and the usual stepup in demand for burning oils. However, an increase in demand for the heavier residual fuel caused stocks to be dropped slightly during the week, as the settlement of the maritime strike resulted in increased call for fuel.

Production of crude during the week of November 9 averaged 4,779,000 barrels daily, an increase of 20,000 a day from the previous week's 4,769,000 daily This daily output was 328,000 barrels or 7.4 percent more than the 4,451,000 barrels produced in the week of November 10, last year.

Crude runs to refinery stills during the week of November 9 totaled 4,714,000 barrels per day, a drop of 55,000 barrels from the previous week's 4,769,000 daily rate, but 18,000 barrels or 4/10 of one percent more than the 4,696,000 barrels run daily during the comparable week of last year.

Stocks of refinable crude stood at 221,870,000 barrels on November 2, an increase of 686,000 barrels over the 221,184,000 barrels held a week before, the Bureau of Mines reported. These stocks held November 2 exceeded the 221,031,000 barrels on hand a year previously by 839,000 barrels or 4/10 of one percent.

Production of gasoline, including natural blended at the refineries, totaling 15,001,000 barrels in the week ended November 9, represented an increase of 407,000 barrels over the previous week's 14,594,000 barrels, but was 337,000 barrels or 2.2 percent short of matching the 15,338,000 produced in the corresponding period of last year. Stocks of finished and unfinished gasoline totaled 86,963,000 barrels after additions of 1,033,000 barrels had been made during the week. These stocks held were 7,985,000 barrels or 10.1 percent higher than the 78,978,000 on hand a year before.

Plant output of distillate fuel oil totaled 5,401,000 barrels, an increase of 30,000 over the previous week's 5,371,000 and 669,000 barrels or 14.1 percent over the 4,732,000 barrel output of the comparable period of 1945. Distillate stocks totaled 67,286,000 barrels to show an increase of 1,343,000 barrels during the seven-day period. These stocks, which are at an all-time peak, topped the 45,143,000 barrels held in storage a year previously by 22,143,000 barrels or 49.1 percent.

Trends of Operations and Changes in Stocks

Figures on crude stocks are from Bureau of Mines weekly reports; all others from American Petroleum Institute weekly reports, which are estimates on Bureau of Mines basis.

(All figures in thousands of barrels—add 000)

HIGHS AND LOWS OF RECENT YEARS

ITEM	Crude Oil Prod.		Runs to Stills		Crude Stocks		Gasoline Stocks		Gasoil and Distillate Stocks		Residual Fuel Oil Stocks	
	Barrels Daily	Week Ended	Barrels Daily	Week Ended	Barrels	Week Ended	Barrels	Week Ended	Barrels	Week Ended	Barrels	Week Ended
Highs:												
1941	4,337	11–22	4,120	10–18	266,187	3–29	99,727	3–29	54,983	11–15	102,448	1– 4
1942	4,337	2– 7	3,961	1– 3	263,208	3–28	[1]109,281	3–14	47,861	11–14	95,857	1– 8
1943	4,436	11–13	4,331	12– 4	245,752	5–29	94,159	3–20	47,187	11–27	72,881	1– 2
1944	4,762	9–30	4,798	12–30	240,992	1– 1	89,162	4– 1	48,162	10–28	64,744	10– 7
1945	4,944	7–21	[1]5,140	8–18	227,554	10–13	99,012	3–24	45,341	11–17	56,074	1– 6
1946	[1]4,961	6–15	4,911	8–31	229,430	3– 2	105,233	2–16	[1]67,286	11– 9	61,636	11– 2
Lows:												
1939	[3]1,601	8–26	3,125	2–18	[2]229,127	10–12	71,152	10– 7	20,722	4–15	105,397	4– 3
1941	3,364	1–11	3,490	1–18	240,399	11–15	79,923	10– 4	28,382	4–12	90,914	7–13
1942	3,297	7– 4	3,393	5–23	231,896	12–12	75,934	12– 5	29,240	4–25	72,962	12–26
1943	3,821	1– 9	3,579	3–18	232,191	1– 9	68,182	10–16	30,732	4– 3	57,596	12–25
1944	4,357	1– 1	4,228	2–12	220,258	9– 9	76,302	1– 1	30,232	4–19	49,737	3–18
1945	3,621	10– 6	3,409	10–6	[4]211,813	8–25	70,791	10–13	26,483	3–17	38,548	5–26
1946	4,403	3– 9	4,498	1–12	218,193	1– 5	85,324	9–28	25,131	3– 9	37,289	4– 6

TRENDS OF 1945 AND 1946

Trends in Week Ended	Crude Oil			Gasoline		Gasoil and Distillate		Residual Fuel	
	Production Daily	Runs to Stills Daily	Stocks Week End	Production Weekly	Stocks Week End	Production Weekly	Stocks Week End	Production Weekly	Stocks Week End
1946:									
January 5	4,548	4,651	218,193	14,488	98,494	5,293	35,199	8,867	42,371
January 26	4,626	4,553	220,544	13,622	101,737	5,720	29,498	8,411	39,722
February 23	4,714	4,595	226,699	13,175	104,709	5,728	25,398	7,913	39,290
March 30	4,425	4,684	224,994	13,896	104,715	5,337	28,240	8,738	37,746
April 27	4,672	4,685	224,443	14,228	99,631	5,568	30,466	9,204	39,404
May 25	4,759	4,857	222,214	14,322	95,769	5,463	32,973	8,908	43,368
June 29	4,957	4,854	223,883	14,500	92,333	5,325	37,762	8,828	46,447
July 27	4,926	4,896	223,756	14,535	88,626	5,817	44,316	8,217	49,517
August 31	4,833	4,911	227,132	15,014	87,217	5,630	53,134	8,539	53,173
September 28	4,778	4,829	223,043	14,675	85,324	5,632	59,827	8,172	57,657
October 5	4,737	4,865	221,782	15,340	85,409	5,687	62,214	8,194	58,611
October 12	4,737	4,867	221,931	14,933	86,585	6,166	63,412	8,454	59,753
October 19	4,733	4,779	220,774	14,874	85,930	5,666	64,761	7,509	60,512
October 26	4,730	4,758	221,184	14,863	86,423	5,710	65,499	7,728	60,872
November 2	4,759	4,769	221,870	14,594	85,930	5,371	65,943	7,434	61,636
Nov. 9, 1946	**4,779**	**4,714**	.....	**15,001**	**86,963**	**5,401**	[1]67,286	**7,503**	**61,340**
Nov. 10, 1945	**4,451**	**4,696**	[5]221,031	**15,338**	**78,978**	**4,732**	**45,143**	**8,761**	**46,193**
Change:									
In Week	+20	—55	+686	+407	+1,033	+30	+1,343	+69	—296
In Year	+328	+18	+839	—337	+7,985	+669	+22,143	—1,258	+15,147
In Year	+7.4%	+0.4%	+0.4%	—2.2%	+10.1%	+14.1%	+49.1%	—14.4%	+32.8%

[1] All time peak. [2] Lowest between January, 1922 and July 1, 1944. [3] Lowest since October, 1922 due to shutdown of six Mid-Continent states. [4] Lowest since December, 1921. [5] Stocks, November 3, 1945.

Prices Remain Unchanged With Gasoline Demand Still High

The industry's market prices remain unchanged for the most part from last week, with demand for gasoline remaining high and steady and the call for heating oils increasing slowly.

There have been no reports of price changes on fuel oils, though storage problems continue to exist, especially on the north Atlantic seaboard. Gasoline prices are generally steady throughout the nation, with only a few reports of price increases in the Middle West and a reduction on the southern Atlantic Coast. No additional reports have been made on crude premium payments or crude price postings, while crude supply remains scarce in some areas.

Storage of No. 2 fuel oil in the northeast, particularly in New York harbor, continues to present a serious problem. Reports say the condition is even more critical than at the time of the price break, and that cargoes ordered months ago are arriving to further complicate the situation. It isn't likely that a further price reduction will result, as many believe that it will be hard to move at any price until colder weather arrives. Many fuel oil jobbers took advantage of last month's price recession to fill their available storage; this, with the weather, continues to hold down sales. The user of home heating oils buys according to weather and his needs rather than price.

Although crude remains short in supply in some areas, there have been no additional reports of premium payments, or rumors of hikes in postings. Several refiners in Central Michigan report their plants operating under capacity due to crude shortages, which is partly the cause of the tightness of gasoline and burning oil supplies in that area.

Gasoline remains a good seller throughout the country, with only a few sections of the Mid-Continent reporting drops in sales due to heavy rains and some snow. With only a few exceptions, gasoline prices remain unchanged. One Midwestern marketer reported advancing his price on Ethyl .25 cent to 7.25 cents, while another boosted his prices .125 to 7.125 cents for Ethyl and to 6.5 for regular. Stanolind Oil & Gas Company reduced its consumer tank wagon price for Red Crown (regular) .9 to 11 cents in Wichita, Kansas, effective November 7. A supplier o nthe southern Atlantic coast reduced his regular-grade price .4 to 8 cents for that area.

☆ Oklahoma

Garvin County Wildcat May Open New Simpson Sand Pool

Garvin County wildcat may open new Simpson sand pool; second Bromide producer brought in at Southwest Maysville pool; new oil pool opened in Creek County; Ashland may drill directional well on edge of North Slick pool; new lease play sweeping flanks of Kiamichi Mountains.

Garvin County: Max Pray and R. L. Beauman apparently are opening a new oil pool with Martin 1, CNE NE 1-4n-4w. The test, in the northwest corner of the county and southeast of the North Lindsay pool, showed oil in 5 zones in the Bromide sand. The shows were logged from 9330-50, 9997-10,022, 10,030-46, 10,092-152, and 10,168-180 feet. Sixty feet of oil was recovered in the fourth zone, from 10,030-46 feet, and crew is testing through perforations. The Martin's total depth is 10,187 feet.

The Bromide formation is again paying off in the Southwest Maysville pool of Garvin County. The second producer from this formation for the field has been brought in by Anderson-Prichard Oil Corporation. Litton 1, NW NW NE 30-4n-2w, made a good show of oil from 7454-62 feet, and is now flowing from that depth at approximately 20 barrels per hour. The discovery well of the field was completed in the Pennsylvanian. The Carter Oil Company opened the Bromide horizon with Eskridge 1, NE NW SW 19-4n-2w.

Creek County: A new oil pool has been opened by Midland Co-Operative Association's Swingle 1, SE SE NE 16-18n-8e, in the north-central part of the county. The well swabbed 25 barrels of oil naturally from the Red Fork sand, which was topped at 2685 feet. This well may result in a revival of an area that was discovered years ago by the late J. E. Crosbie.

Having drilled a well in CNE NE 21-16n-10e, North Slick extension pool of Creek County, which is a non-producer, Ashland Oil & Refining Company has asked the Oklahoma Corporation Commission for a permit to whipstock so it would be bottomed 165 feet west of the east line of the drilling unit. The company expressed the belief that the 10-acre tract involved is an edge location, but that the east half of the tract would be productive if the well can be whipstocked as requested. Hearing will be held in Oklahoma City November 26.

Kiamichi Mountain Area: A new lease play is apparently in progress on the flanks of the Kiamichi (Ouachita) Mountains of Southeastern Oklahoma. This area has seen no commercial oil production, although there have been many tests drilled and abandoned. At least 2 wildcats, 1 each in Choctaw and Pushmataha counties, have been staked. Cargill Brothers, Longview, Texas, operators, have announced location for Jordan 1, SW SW SE 6-15s-15e, southwest of Antlers, in Northwestern Choctaw County. This test, slated to 6500 feet, is on a block of approximately 14,000 acres. Porter Newman, Durant, Okla., operator, has staked Basket Ranch 1, in SE SW NE 4-1s-16e, northwest of Eubanks, Western Pushmataha County. To be drilled to 3000 feet, the Ranch 1 is on a block of 12,000 acres.

☆ Kansas

Old Silica Field Oil Well Yields Big Flow of Gas

Old oil well in Silica field makes big gas flow; Webster pool well gets 2350-barrel potential; 2 wildcats staked near Marion.

Rice County: An old oil well in the Silica oil field flowed 11,700,000 cubic feet of gas following workover operations and plugging back. The finding of a great amount of gas in this former oil producer leads geologists and field men to believe that a substantial gas producing pool will be opened in the center of the 10-year-old Silica field. The gas discovery was made by Courtney B. Davis, Wichita operator, with Dueser 2, NE NE SW 31-19s-10w. The well was plugged back to the Kansas City lime, where plug was set at 3203 feet. Porosity and stain from 3172-90 feet were shown on electrical log, and pipe was ripped, and the well treated with 1000 gallons of acid. While crew was running rods, the well cleaned itself of the water load, and a rock pressure of 960 pounds developed within an hour. This pressure increased to 1030 pounds in 18 hours. The gasser flowed wild for a day and a night, but was brought under control, and subsequently gauged.

Rooks County: One of the best wells for Kansas this year has been completed in the Webster pool by Bird & Boering. Veverka 2, NE SW SW 27-8s-19w, has been completed for a potential of 2350 barrels of oil daily from Arbuckle lime, between 3405-11 feet. This is the third well in the pool with a potential of more than 2000 barrels per day. Veverka 1, completed in April, made a potential of 2540 barrels a day. Stanolind Oil & Gas Company's Stice 1 made a potential of 2495 barrels.

Marion County: S. & S. Oil Company plans 2 interesting wildcat tests in the vicinity of the town of Marion, based on surface and sub-surface geological information compiled by Hal Redmon, Wichita geologist. Stallwitz 1, NW NE SE 2-20s-4e, is located 3 miles east of Marion and 8 miles north of the Florence pool. Machinery is now being rigged up for the test, which is being supported by G. P. Jones of Emporia, Kansas, Aylward Production Company, and Stanolind. Four miles north of the town, Dwight Wilson has staked Holub 1, NW SW SE 5-19n-4e. The test is on a block which includes portions of Secs. 4, 5 and 8-19s-4e, and parts of Secs. 32 and 32-18s-4e. Wallace Slusser is the contractor.

Wells Completed in United States in Week Ended November 9, 1946

State or District	FIELD COMPLETIONS: New Wells Oil	Dist.	Gas	*Input	Dry	Total	Old Wells Deepened	EXPLORATORY COMPLETIONS Oil	Dist.	Gas	Dry	Total	ALL COMPLETIONS This Week	Last Week	This Week 1945
Alabama														1	2
Arizona											1	1	1		
Arkansas	2				1	3					3	3	6	2	8
California	30		1			31	2				2	2	35	34	28
Colorado	1					1							1	3	1
Florida					1	1							1		
Illinois	21				10	31	2	1			10	11	44	39	33
Indiana	6				2	8	1	1			2	3	12	13	3
Kansas	23		5		13	41	4				6	6	51	35	31
Kentucky	7				6	13					2	2	15	12	15
Louisiana	16	1			9	26			1		5	6	32	33	33
North Louisiana	11				3	14					3	3	17	16	15
South Louisiana	5	1			6	12			1		2	3	15	17	18
Michigan	6				5	11					4	4	15	18	25
Mississippi	5	1			2	8		1		1	2	4	12	10	7
Missouri														2	
Montana	4					4							4	6	5
New Mexico	6				1	7	1				2	2	10	7	6
New York	15			10	1	26							26	26	25
Ohio	9		14		9	32				1		1	33	31	7
Oklahoma	43		4	1	17	65	2	3			14	17	84	99	57
Pennsylvania	27		5	15		47	1						48	51	46
Texas	77	1	10		37	125	3	3		1	26	30	158	170	167
E. Tex. Bor. Co.'s			3			3							3	6	4
Rest of E. Texas	4		1		1	6							6	12	7
North Texas	11				15	26		1			6	7	33	51	39
W. Central Texas	6		1		9	16	1				3	3	20	18	12
West Texas	29		4		6	39	2			1	4	5	46	36	39
Texas Panhandle	2		1			3							3	4	23
G. Coast, Upper	7				1	8					5	5	13	10	13
G. Coast, Lower	11	1			1	13		2			1	3	16	19	26
Southwest Texas	5				4	9					6	6	15	9	3
S. Central Texas	2					2					1	1	3	5	1
West Virginia	3		12		2	17	1						18	19	17
Wyoming	2					2					2	2	4	2	7
Total U.S.	303	3	51	26	116	499	17	9	1	3	81	94	610	613	528

* Includes salt water disposal wells.

☆ New Mexico

Prospective Ellenburger Area Is Eliminated by Granite

Prospective Ellenburger producing acreage in Brunson area eliminated by granite; Hobbs field deep test logs additional shows; fully developed Pre-Permian beds logged by Chaves County wildcat void of production.

Lea County: Skelly Oil Company's Baker 5-B, C SE SW 10-22s-37e, north offset to the most southeasterly Ellenburger producer in the Brunson area, missed its objective due to encountering granite at 7312 feet with elevation 3417 feet, and will complete in the 6400-foot Yeso. Cities Service Oil Company-Repollo Oil Company's Brunson 1-B, NE SE 4-22s-37e, and near the Ellenburger pinchout, confirmed production from Ellenburger in recovering 630 feet of oil and 330 feet of oil- and gas-cut mud when tester was used at 7407-60 feet. It will continue to granite before running pipe for completion.

Sun Oil Company's McKinley 1-B, northeast edge of the Hobbs field, continues to brighten the outlook for multi-pays in the Middle and Lower Permian in the field proper through logging oil and gas shows without water at intervals. A drill-stem test was pending of oil stained lime at 7550-75 feet.

Skelly Oil Company's Steeler 2, C NE NE 17-23s-37e, projected Ellenburger test for the Skelly area, was drilling at 9110 feet, having entered the Montoya, Upper Ordovician, at 8345 feet. The company's Yadon 1, projected 8000-foot wildcat and 5¾ miles northeast of the Lovington field, was drilling without shows at 5030 feet.

Chaves County: Magnolia Petroleum Company et al's Black Hills Unit 1 was abandoned in quartzite, topped at 6065 feet and drilled to 6085 feet. This wildcat is the first for the general area to encounter fully developed Pre-Permian beds, thus revealing the possibility of deep oil. It logged comparatively short section of Pennsylvanian followed in order by Mississippian, Devonian, Fusselman, and Simpson. Barren Ellenburger was entered at 5520 feet, and base of the El Paso lime was called at 5830 feet, followed by 100-foot sand beds. Metamorphic shale prevailed from 5930 to 6065 feet.

☆ West Texas

Schleicher County Has Promise Of First Permian Discovery

Schleicher County has promise of its first Permian discovery; Ordovician prospect in Ward County logs additional showings; lease expirations occur on number of incomplete tests in the Block 12 field.

Schleicher County: L. W. Elliott, Trustee's Tisdale 1, C NW NW HE&WT Railway 16, Block A, 4½ miles northwest of Strawn oil production in the Page field, was preparing to set pipe for production test after showing considerable oil-cut mud when tester was used at 2709-26 and 2744-74 feet. This showing is in Basal Permian, and was not anticipated as the Permian has heretofore offered no encouragement for production in the general area.

Ward County: Phillips Petroleum Company's University 1-B, 1½ miles southeast of Pyote and the initial try for Ordovician production for the area, logged additional oil shows in Basal Permian samples at 10,330-10,350 feet, and was drilling lime at 10,525 feet. Probable commercial production was passed up in the Wolfcamp.

Stanolind Oil & Gas Company's Sealy-Smith 1-B, wildcat and 2½ miles east by south of the Estes-North Ward field, recovered additional oil and gas, but reached the water table, when tester was used at 4974-5020 feet in Glorietta, topped at 4820 feet. It was drilling at 5240 feet, and will explore the Clear Fork before running pipe for a production test. The company's Sealy-Smith 14, 2 miles east of Ellenburger production in the Monahans field, missed prospective Permian pays, and was running protection string at 7012 feet to deepen to the Devonian.

Winkler County: Santa Fe Petroleum Corporation's Wheeler-Magnolia 1, Ellenburger wildcat, was drilling lime and shale at 6750 feet. The Glorietta and Clear Fork were topped at 5360 and 5730 feet, respectively. These markers correlate 72 and 52 feet low, respectively, to a 7006-foot failure 2⅔ miles southeast.

Ector County: Gulf Oil Corporation and E. E. Fogelson's University 1-A, Ellenburger test for the Jordan field, recovered 310 feet of oil- and gas-cut mud and 210 feet of sulphur water when drill-stem test was made of the Glorietta-Clear Fork contact. Second test at 5242-5427 feet in the Clear Fork yielded 100 feet of oil- and gas-cut mud and 270 feet of mud with nominal shows. Coring was resumed as this zone is a prospective source of production. Gulf made its heaviest cash investment for lease protection around a deep prospect during its many years of successful operations in West Texas in paying Fogelson et al $1 million cash for undivided half interest in deep rights under four 160-acre leases, plus a free Ellenburger test. The company has contracted to pay Kewanee Oil Company $250,000 cash for undivided half interest in deep rights under 2 nearby 160-acre leases.

Gulf's Goldsmith 421-E, projected Ellenburger test for the high part of the Goldsmith field, landed 9⅝-inch protection pipe through the regular pay at 4300 feet. Phillips' TXL 1-M is to be drilled to the Ellenburger, and is 1¼ miles west of the Goldsmith field.

Murchison Field: American Republics Corporation's TXL-Texaco 1, ⅝ mile southeast of the Devonian discovery, was drilling lime and chert at 10,315 feet. Phillips et al's Millard Unit 1, ⅞ mile southwest of the producer and structurally low, was drilling lime and chert at 9245 feet, with some doubt of it being carried to the Ellenburger.

Pecos County: Helmerich & Payne, Inc.'s White-Baker 9-C, ⅝ mile west by north of the single Strawn producer in the White & Baker field and a failure in this zone, entered barren Ellenburger at 9400 feet, or 45 feet high to the plugged back discovery, and was drilling dolomite at 9730 feet without shows.

Andrews County: Olson Drilling Company and Skelly Oil Company's Lockhart-Brown 1-A, 1⅝ miles northeast of the Martin field and lower structurally, was making a drill-stem test of broken saturation and porosity in the Clear Fork at 6807-69 feet. Globe Oil & Refining Company's Lockhart & Brown 1, ⅝ mile southwest of the Fuhrman-Mascho field, was drilling lime and chert at 8320 feet, having passed up nominal shows in the Clear Fork.

Block 12 Field: Completion gauges were being rushed on more than a dozen wells in this Clear Fork producing area during the fore part of the week in an attempt to forestall University lease expirations on November 14. The Atlantic Refining Company had reported 8 officially gauged, and was at work on others. A considerable number failed to obtain commercial production before the deadline, and lease contracts are automatically voided. Two Devonian prospects are expected to make sufficient oil to validate leases, but the yield does not warrant development.

Union Field: Shell Oil Company's Scarborough 1-E, offsetting Clear Fork production, was drilling dolomite and shale at 9705 feet in Ellenburger, topped at 9380 feet. This zone yielded 7500 feet of sulphur water at 9528 feet. It may be carried to granite for geological information, as it is unusually high for the area and more explorations will occur upstructure to the east or northeast.

Bedford Field: Shell and The Texas Company's Ratliff-Bedford 3, ½ mile north by west of the multi-pay discovery, was drilling lime and shale at 11,364 feet and is nearing the water table without reaching the Ellenburger. However, it passed up flowing production in the Devonian. The partnership's Ratliff-Bedford 4, ⅓ mile southwest outpost, entered the Ellenburger at 11,155 feet, or 146 feet low, and will complete in this zone from open hole at 11,161-324 feet, and then try for dual completion from the Devonian.

Ratable Production for Carthage Being Considered

A gas production proration plan, expected to result in ratable production on an accumulative basis in the Carthage gas field, and thus protect correlative rights of various operators, is now under consideration by the Texas Railroad Commission. The plan, first of its kind, originally was conceived by Lone Star Gas Company, one of the operators, and following advice and criticism of other operators was rewritten and submitted to the commission. The plan provides for underproduction of allowables with accumulation of unproduced portions of the allowable accruing to the well for production as needed. A well may be overproduced as much as six times the current monthly allowable; however, each well must show as underproduced sometime during the year to balance total production with allowable.

In the presentation of the plan to the commission, it was pointed out that to attain ratable production in the Carthage field, it would be necessary to allow sufficient flexibility to compensate for unforeseen demands that may occur, then to recalculate allowables at the end of the month after the market has been supplied and the gas production of the field is known.

Operators contemplate that subsequently the commission will calculate the production for each month in the same manner. Records of over and under-production can be set up and carried forward to the current schedules issued and will show current allowable and adjusted allowable.

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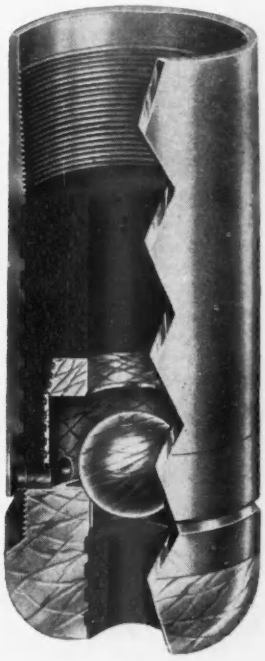

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☆ North Texas

Wilbarger Test Has Thick Pay At Canyon-Strawn Contact

Northwestern Wilbarger County discovery has thick pay at Canyon-Strawn contact; Hildreth field expanded ½ mile west; shallow discoveries made in Archer and Young counties.

Wilbarger County: National Associated Petroleum Company and The Texas Company's Crouch 1, NW NW NE H&TC Ry. 24, Block 16, 6 miles southwest of the Odell field, was installing spudder to complete through perforations with 5½-inch casing at 5400 feet after plugging back from 5612 feet. This wildcat indicated commercial production when a drill-stem test at 5065-96 feet yielded gas to surface within 14 minutes, and the recovery consisted of 180 feet of free oil and 330 feet of oil- and gas-cut mud. Second test at 5112-36 feet showed gas to surface within 6 minutes. The recovery consisted of 225 feet of oil, 180 feet of oil- and gas-cut mud, and 845 feet of salt water. An unidentified lime was entered at 5012 feet, with elevation of 1342 feet. The production occurs near the Canyon-Strawn contact, but is believed to be from the Strawn. Lease ownership in the area points to competitive drilling if the production warrants.

Montague County: Hays Robertson et al's Henry 1, N. Kimbro Survey and ½ mile west of the north portion of the Hildreth field, was flowing into pits to clean itself from Bend conglomerate perforations at 5892-6022 feet after drilling to 6173 feet. This outpost is rated at 50 barrels of oil hourly. The owners purchased the 450-acre lease from Larry Hults and Tom Owen for $50,000 cash, with the latter carried for ⅛ override. Rig has been skidded for a south offset.

Nu-Enamel Oil Operating Company's Perry 1, L. S. Farrer Survey A-282; 3 miles west of St. Jo, was running pipe after drilling to 7104 feet in Bend, topped at 6431 feet with elevation of 1270 feet. This wildcat logged nominal shows in several zones, but apparently eliminated the Bend in testing salt water at 6449-59 feet.

Haskell County: Thos. D. Humphrey's Chapman 2, twin test to flowing discovery in Strawn at 4070-82 feet, was drilling at 3500 feet to try for production in Lower Strawn at 4240-4315 feet after the discovery failed to obtain a decisive test of the latter due to faulty cement job. Chapman 1 will remain shut in until the second test has drilled through the lower pay and landed pipe on bottom. This is the first Strawn production for the county. Humphrey's Collier 1, 1-1/16 miles southeast of the Lawson field, missed the 2800-foot Adams Branch lime pay, and was drilling below 4000 feet to explore the Strawn.

Discoveries: Staley Oil Company's Powell 2, J. M. Armstrong Survey, A-763, Archer County, pumped 10 barrels initial from Cisco sand at 938-42 feet. Nearby dry holes will restrict production to a small area. In Young County, L. T. Burns et al's Ellis 2, NE SW Sect. 207, TE&L Company Survey, pumped 9 barrels initial from sand at 764-72 feet. It is a twin well to Burns et al's Ellis 1, which is making a small flowing well from the Mississippian at 4848-65 feet, being the second deep producer for the area. In Cooke County, Hollandsworth Drilling Company's H. E. King 1, M. Langham Survey, A-564, and ⅞ mile southeast of production, is rated as a 10-barrel pumper from sand at 1005-10 feet.

☆ East Texas

Cherokee Wildcat Passes Up Gas to Explore Travis Peak

Cherokee County wildcat passes up indicated commercial gasser from top of Rodessa to explore Travis Peak. Mont Sylvan field has failures, although structuraly high; Smackover test in Freestone County encounters high-pressure zone.

Cherokee County: Standard Oil Company of Texas' New Birmingham Development Company 1, G. E. Lojoney Survey and 10 miles southeast of Woodbine production in the Boggy Creek field, tested a strong flow of high-pressure dry gas at 8635-62 feet in the Bacon, or Upper Rodessa. This zone showed good porosity at 8646-65 feet, and a second drill-stem test at 8658-75 feet also yielded gas. The water level in the Rodessa was reached when a test at 8731-43 feet yielded 400 feet of salt water. Drilling was resumed to fulfill Travis Peak depth contract before running pipe for completion, as Magnolia Petroleum Company and other owners of close-in leases posted dry-hole money.

W. H. Foster et al's Ellis 1, ¾ mile east of Summerfield and a short distance south of The Pure Oil Company's 4452-foot Woodbine failure, is credited with correlating 35 feet high on the Navarro chalk, and was drilling at 3340 feet.

Freestone County: The Texas Company's White 1, Wm. King Survey and west of the Fairfield multi-pay gas field, was drilling at 1,990 feet, and apparently above the Buckner. The Cotton Valley was entered near the 9730-foot level, and considerable pressure developed while changing bits at 11,385 feet, but this may be attributed to air in the drill pipe.

Smith County: Humble Oil & Refining Company's Clark 1, 3000-foot northwest outpost for the Mount Sylvan 2-well field, failed to indicate production in reaching water sand in core at 7216-29 feet and was coring at 7255 feet. This outpost entered the Paluxy at 7090 feet, with elevation of 404 feet, and is the highest, but the sand was absent. The company's Pool 2, southwest outpost and a failure in Paluxy, was reaming core hole at 7450 feet. Operations on the company's other 4 tests for the area have been suspended.

Delta Drilling Company's Boynton-Magnolia 1, 1½ miles east by north of the Mount Sylvan area, entered the Comanche lime at 6128 feet, and was drilling at 6470 feet.

Phillips' Petroleum Company's Tray Unit 1, South Tyler field and apparently a failure in the Rodessa, was drilling sand at 10,395 feet in Barren Travis peak, topped at 10,375 feet.

Limestone County: Dail Goodson et al's Nance 1, J. D. Brown Survey and 3½ miles south of Thornton, is credited with running electrical log to check reported oil show at 3579-94 feet. C. W. Killough et al's Arnet 1-A, 5 miles northwest of Groesbeck, is showing 5 to 10 percent black oil with prolific flow of salt water from Pettit perforations at 5434-64 feet.

Harrison County: A 4000-foot northwest extension of the Rodessa zone gas production in the Whelan field appears assured through Placid Oil Company and Gulf Oil Corporation's Dunn 2, Simpson Survey. The well topped Rodessa porosity at 8892 feet, showing gas. Casing was set at 8000 feet for a Pettit test.

Continental Oil Company and Stanolind Oil & Gas Company, judging by additional leases on 850 acres filed for record, are apparently preparing for a deep wildcat east of Woodlawn.

Shelby County: B. F. Phillips' Pickering Lumber Company 1, 3 miles north of Shelbyville, G. Russell Survey, is drilling after setting surface pipe at 1000 feet. The test, located on a farmout from Edgar C. Johnston, who assembled a block of several thousand acres in that area several years ago, will go to the Pettit at the 6600-foot level.

Texas Lease Sale

A joint auction sale of mineral leases on 335,000 acres of Texas land has been set for December 3, in Austin, by the General Land Office and the School Land Board. Included are 468 tracts located in 19 counties.

Surveyed school lands to be leased involve 2365.75 acres located in Duval, Harrison, Panola, Jones, San Patricio, Starr and Orange counties. Leases to be offered on stream beds comprise 2349 acres in Fisher, Hutchinson, Jackson and Victoria counties.

Approximately 1241 acres of lakes and marshes in Jackson County will be up for bidding. Submerged areas comprise the major portion of land involved in the sale. Tracts in these areas comprise 329,045.02 acres located in Galveston, Harris, Nueces, Chambers, Matagorda, Calhoun, Kenedy and Kleberg counties.

Natural Resources Meet

Action on President Truman's proposal for a world scientific conference on conservation and utilization of natural resources is expected to be taken early next year by the United Nations Economic and Social Council if a sufficient number of UN member nations show interest.

The major divisions of discussion would be renewable natural resources and non-renewable resources, particularly petroleum, and questions of new techniques, possible substitutes, future world needs and the local administration of resources.

Action will be postponed and the meeting tentatively scheduled for 1948 if a current survey shows lack of interest.

Trans-Arabian Plans

Trans-Arabian Pipe Line Company now is conducting negotiations for rights-of-way in Syria for the firm's proposed 1200-mile 30-inch pipe line from Arabian oil fields to a Mediterranean port. Agreements with Palestine, Trans-Jordan and Lebanon give the company the right to construct one or more pipe lines and all facilities, as well as construct refineries, railways and make other installations. Included in the plans is the construction of a refinery in Egypt, probably near Alexandria.

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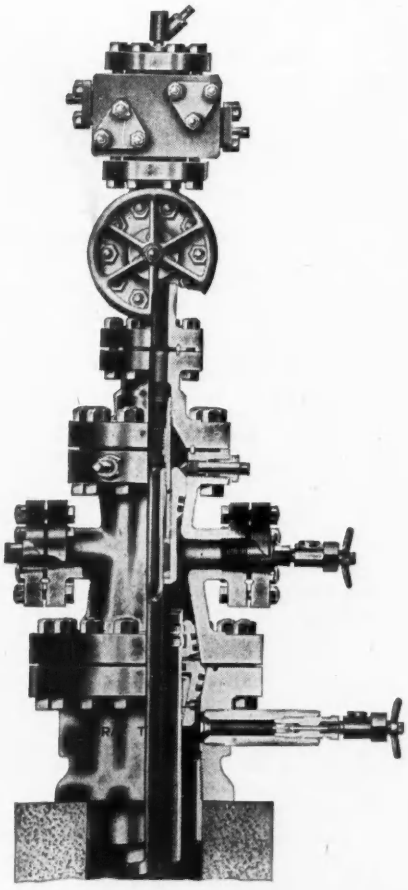

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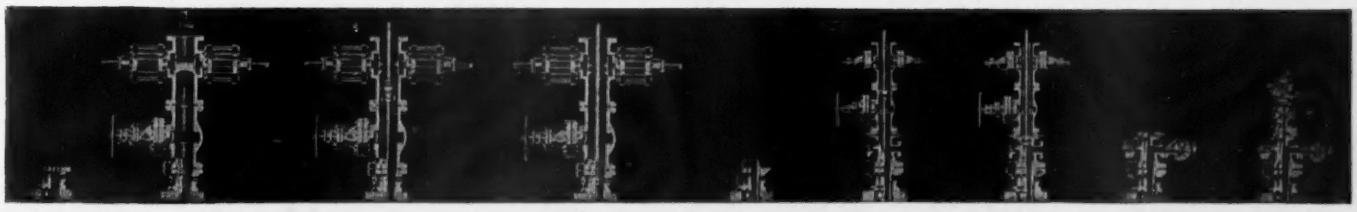

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☆ Southwest Texas

Jim Hogg County Wildcat Has Flow of Gas on Initial Test

Jim Hogg County wildcat flows gas on initial test; wildcat north of Roma swabs oil; new producer for Cortez field being completed.

Jim Hogg County: Newman Bothers Drilling Company and F. A. Callery et al's Pena 1, wildcat ½ mile southeast of Callery's Pena 1 shallow gas well, flowed gas on test of perforations at 1576-80 and 1476-86 feet, with tubing pressure 175 pounds and casing pressure 250 pounds. These perforations were squeezed and casing reperforated at 1484-88 feet where a show of oil and gas was recovered along with considerable salt water. Total depth is 2977 feet with 5½-inch casing set to 1625 feet. Location is 330 feet south, then 220 feet east from the southeast corner of Survey 579 in Mrs. L. Bartlett Survey 589, A-33.

Starr County: Tarver & Staggs Company's Loreto Canales 1, wildcat 23 miles north of Roma, swabbed oil with a small amount of water from open hole at 1700-15 feet. Three-inch liner is set at 1690-1715 feet. Operators are presently fishing for swab line. First swab test recovered fresh water with a show of oil and the open hole was squeezed prior to second swab test. This test is a deepening job in the old George R. Boyle's Canales 1 dry hole, abandoned at 1602 feet last December.

W. L. Goldston's R. C. Roos, Jr., et al's 5, Cortez field, has set flow valves for completion after drilling to 3335 feet. Casing is perforated at 2960-64 feet. A drill-stem test at 2964-72 feet recovered 420 feet of fluid, 80 percent oil. A test at 3280-84 feet recovered salt water.

☆ South Central Texas

Atascosa County's Charlotte Field Outpost Has Oil Flow

Charlotte field outpost flows oil; potential awaited at new Jourdanton field producer; Edwards County wildcat in Ellenburger lime; deep Gonzales wildcat drilling below 6500 feet.

Atascosa County: The Bering Company's Koemel 1, Charlotte field outpost, flowed 50 barrels of oil per day on a 7-hour test through 7/64-inch choke, with tubing pressure 250 pounds and casing pressure 600 pounds. Flow was from perforations at 5135-5210 feet, in the Navarro sand, and operator is now waiting on potential gauge of the flow. The test is presently flowing 2½ barrels of oil per hour through ¼-inch choke. This test is 4900 feet southeast of Humble Oil & Refining Company's Johnson 1.

Humble's Pfeil 1, 1500 feet west of the Alamo Lumber Company's No. 1 well at Jourdanton field, is waiting on potential after flowing 50.05 barrels of oil daily through 3/32-inch choke. Production is from open hole at 7406-10 feet in the Edwards lime.

Edwards County: Ray Pool's Peterson 1, wildcat 20 miles north of Rock Springs, is drilling below 5016 feet in the Ellenburger lime after running electrical log to 4800 feet. Drill-stem tests at 4360-4733 and 4760-4800 feet were dry.

Gonzales County: Quintana Petroleum Company et al's Alfred Speickermann 1, deep wildcat 7½ miles south-southwest of Gonzales, is drilling below 6500 feet. This test is being drilled by Newman Brothers Drilling Company and is in William Newman Survey A-362, 2600 feet from the northwest line and 7500 feet from the northeast line.

☆ Lower Texas Coast

San Patricio County Wildcats Indicate Oil Field Discovery

New oil field for San Patricio County indicated; La Gloria south outpost completed as gas-condensate producer; Pettus sand production discovered at Cabeza Creek; West Ranch northwest outpost completed as dry gas well.

San Patricio County: Hewit & Dougherty's Lois Thornton 1, wildcat 2 miles northwest of San Patricio townsite, has indicated a new oil field for the area. A drill-stem test at 5395-5400 feet, with ¼-inch choke top and bottom, developed 350 pounds working pressure in 15 minutes and recovered 55 feet of high gravity oil. Another test at 5441-50 feet, under the same conditions, recovered 285 feet of oil. Hole was drilled ahead following these tests. This wildcat is just north of the Nueces County line and about 6 miles northwest of the Riverside field.

Brooks County: Magnolia Petroleum Company's Zimmerman 1, outpost a mile south of production at La Gloria field, has been completed as a gas-condensate well from perforations at 7552-67 feet. From these perforations the well cleaned out with 2300 pounds working pressure, through ¼-inch choke.

Goliad County: Continental Oil Company's J. E. Pettus et al 11, east outpost test at Cabeza Creek field, has discovered Pettus sand production. A drill-stem test at 4530-35 feet recovered 420 feet of 43-gravity oil in 15 minutes with 70 pounds working pressure. Another test at 4535-40 feet developed 100 pounds working pressure in 18 minutes and recovered 710 feet of 44-gravity oil. Both tests were made in the Pettus sand. The test is now coring for the regular 7600-foot Wilcox pay sand for the field.

Jackson County: Wm. M. Nichols' John M. Bennett 1, outpost 2000 feet northwest of Magnolia's Bennett 9 on the extreme west edge of West Ranch field, has been completed as a dry gas well. Total depth is 5755 feet with casing perforated for completion at 5076-83 feet. Prior tests were made at 5469-75, 5099-5101, and 5089-94 feet.

Nomads Induct

At the October 7 meeting of the New York Chapter of Nomads eleven members were inducted. The new members are E. R. Smoley, Lummus Company; A. A. Swanson, The Continental Supply Company; I. S. Forde, Midwest Piping Supply Company; H. Gottwald, Rockwell International Company; George O. Ives, THE OIL WEEKLY; O. B. Latrobe, Hughes Tool Company; A. G. Baldwin and M. C. Hutchinson, Victaulic Company of America; C. P. McDonald, Parkersburg Rig & Reel Company; T. J. Walne, The National Supply Company; and M. D. Rasher, Haliburton Oil Well Cementing Company.

☆ Upper Texas Coast

Northeast Flank Project at Red Fish Reef Completed

Northeast flank test at Red Fish Reef completed; third test in new South Mayes field shows for production; Liverpool discovery goes to salt water and is abandoned; new deep sand producer at Altair given potential; first Brazos River bed producer at North Thompson completed.

Chambers County: Humble Oil & Refining Company's State 24-A, Sect. 224, has been completed as a good well on the northeast flank of production at Red Fish Reef field, Galveston Bay. On potential the well flowed 222 barrels of 38.2-gravity oil daily through ⅛-inch choke from perforations at 8703-18 feet. Total depth is 9395 feet and gas-oil ratio 606/1. This well is 660 feet northeast of the No. 4-A well, nearest producer, and on the northeast edge of production.

Humble's Lula Scherer 1, 1400 feet southwest of the Lula Wallis 1 discovery at South Mayes field, has shown for production. On initial test of perforations at 9235-40 feet a flow of 72 barrels of 34-gravity oil daily was gauged. Tubing pressure was 2900 pounds and gas-oil ratio 990/1. This is the third well in this new field discovered in March of this year. Production is from the Frio.

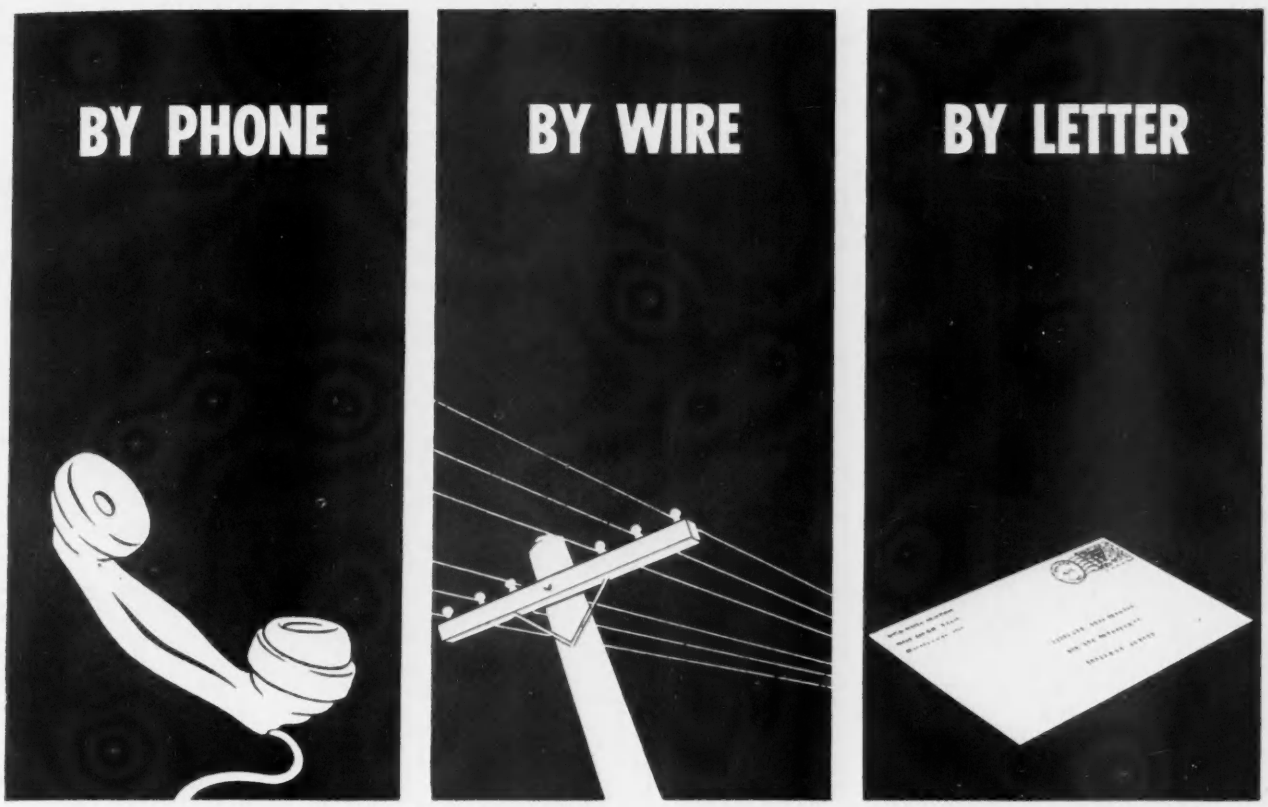
Brazoria County: Pan American Production Company's Callihan Unit 1, discovery well of the Liverpool field, has gone to salt water and has been abandoned. This well was completed in August for a potential of 331 barrels of 40.3-gravity oil daily through 12/64-inch choke, showing 4 percent salt water, with 880 pounds pressure on tubing. Completion was through perforations at 8757-62 feet, but it gradually went to 100 percent salt water. This is the only well in the field and no operations are currently under way in the discovery area. The well is located between production at Rowan and Chocolate Bayou fields.

Colorado County: The Superior Oil Company's Myra S. Pryor 4-A, new deep sand producer at Altair, flowed on potential 117 barrels of 50-gravity condensate daily along with 4,600,000 cubic feet of gas through 16/64-inch choke. Total depth is 10,366 feet and completion is from perforations at 10,174-192 feet. The well is 1590 feet north of the Pryor 2-A well and in BBB&C Survey, Abstract 710.

Fort Bend County: The first producer completed in the Brazos River bed at North Thompson field is Fort Bend Oil Company's State 1. The well flowed on potential 667.33 barrels of oil daily through ¼-inch choke with 925 pounds tubing pressure and 2425 pounds pressure on the casing. Total depth is 8085 feet and production is from perforations at 8010-20 feet.

Terminal Planned

MacMillan Petroleum Corporation, owner of refineries at Signal Hill, Calif., and Norphlet, Ark., has acquired a site at New Orleans for the erection of a $100,000 terminal for the distribution of lube products from its Norphlet plant to the Mississippi Valley area and Mexico and South America. The products will reach the new terminal by barge.



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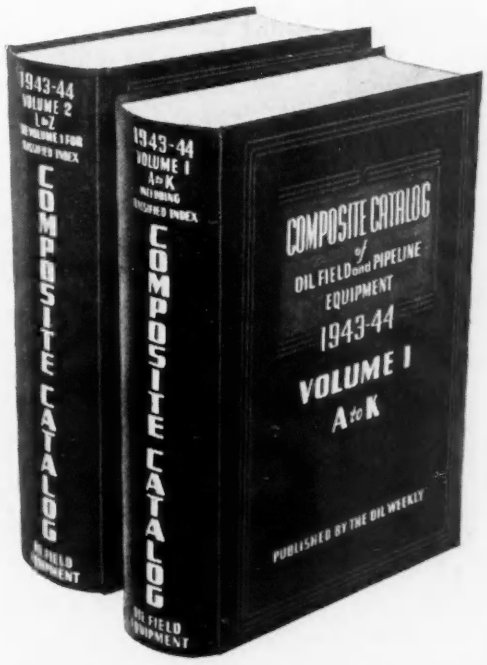

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☆ South Louisiana

Terrebonne Parish Lake Barre Field Is Given New Pay Sand

New pay sand discovered at Lake Barre; new Tuscaloosa sand wildcat located in Big Island area; east flank production at Bon Air defined; dry hole at Queen Bess Island; Fresh Water Bayou outpost drills below 13,774 feet.

Terrebonne Parish: A new deep sand has been discovered at Lake Barre field by The Texas Company's State-Lake Barre 45, Lease 199, 19-21s-20e. On potential the well flowed 32 barrels of 50.3-gravity condensate daily through 8/64-inch choke with 3500 pounds flowing pressure on the tubing and gas-oil ratio of 32,000/1. Production is from perforations at 11,915-924 feet and total depth is 14,021 feet. A test at 12,268-278 feet showed oil, gas and salt water through ⅛-inch choke with 800 pounds flowing pressure.

Rapides Parish: Lynn Oil Company has located Perry 1 as a new Tuscaloosa sand wildcat 2½ miles northwest of Big Island field. Big Island field is the site of the recent Tuscaloosa strike in Central Louisiana, discovered by Union Producing Company et al's Belgard 1 that produced on potential 361 barrels daily. The new test is in 5-4n-3e. Projected total depth is 10,000 feet or more.

Jeff Davis Parish: Sohio Petroleum Company's Gary et al 1, new dry hole at Bon Air field, has defined production on the east flank of the field. It is ¼ mile east of the Claudius Fontenot 1 discovery and in 15-10s-6w. Total depth is 9779 feet and no favorable shows were encountered. Production on the north flank was defined recently by the J. A. Fontenot et al 1, 10,157-foot hole ¼ mile north of Claudius Fontenot 2-B.

Jefferson Parish: The Texas Company's State-Barataria Bay 3, State Lease 356, is a dry hole at Queen Bess Island. Total depth is 11,800 feet and no favorable shows were encountered. The same company immediately made location for another test in the area, the Lafourche Basin Levee District 1, in 30-20s-25e. Projected depth is 11,500 feet.

Vermilion Parish: Union Oil Company of California's Louisiana Furs 4-C, outpost in the Fresh Water Bayou field, 33-16s-12e, is drilling below 13,774 feet. The test is about 2000 feet northeast of well 1-C and projected depth is 14,000 feet. Four gas sand shows are reported to have been encountered between 10,645-11,600 feet.

Plaquemines Parish: The California Company's Louisiana Citrus Lands Inc. 1, new Alliance area field, has been completed as an excellent oil well. It is about 1000 feet south and a little east of the Brady 4, Unit 4, discovery for the field and completed in October as a gas-condensate well. Louisiana Citrus Lands 1 flowed on initial test 207 barrels of clean 38.7-gravity oil daily through ⅛-inch choke from perforations around 9700 feet. This well has been drilled as a tight hole since spudding, and additional information on performance of the well and the exact location of perforations was not divulged. The field is 20 miles south of New Orleans and 8 miles east of Barataria field.

We have a hunch

After doing business for 38 years in the deep South, we have no idea what constitutes the difference, if any, between a Democrat and a Republican. Not one man in fifty is any better informed. That November 5th Republican landslide had nothing to do with party platforms. It was touched off by men and women sick and tired of bureaucracy and the antics of organized labor. We have a hunch the Wagner Labor Relations Act is in for an overhauling. We have a hunch a lot of bureaus are going the way of the OPA. Even a Republican as viewed from the deep South should know on which side his bread is buttered!

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☆ North Louisiana

Franklin Test Is Discovery Or Delhi Field Extensioner

Franklin Parish wildcat is Delhi extension or new field discovery; Delhi ½-mile extension expected in Richland Parish test; DeSoto and Catahoula wildcats have slight shows of oil.

Franklin Parish: C. H. Murphy and Sun Oil Company's J. E. Holt A-10, 6-16n-9e, has been completed flowing 8 barrels of 39-gravity oil daily through ⅛-inch choke, with gas-oil ratio 22,557/1, ranking it as a gas-condensate producer. The well was perforated from 3613-18 feet, with total depth 4524 feet. This test is either a new field discovery, or may be a 2-mile south extension to the Delhi field.

Richland Parish: Gulf Refining Company may have extended Delhi production ½ mile northwest at Prudential Insurance Company of America F-1, NW 20-17n-9e. A drill-stem test of sand at 3159½-3164 feet recovered 1380 feet of 40.7-gravity oil and 30 feet of oil-cut mud without formation water.

One of Delhi's most prolific producers was completed, as Lamar Bryant's Town Unit 1, 13-17n-9e, gauged a flow of 513 barrels of 42.3-gravity oil per day through ¼-inch choke. The well was completed from perforations at 3306-37 and 3350-58 feet, with total depth 3378 feet.

DeSoto Parish: F. A. Callery's wildcat, Bessie C. Strauss 1, 19-14n-14w, 1 mile west of Gloster, is drilling below 4556 feet after an 8-minute drill-stem test at 4069-89 feet, believed to be in the Lower Paluxy, recovered mud, salt water, and some free oil. The showing was not considered of commercial proportions. The well will go to 7000 feet, thought deep enough to reach the Travis Peak.

Catahoula Parish: Lyons and Prentiss and Penrod Drilling Company's P. L. Mitchell 1, C NW NW 36-8n-7e, bottomed at 9471 feet, is attracting attention. Perforations indicated some oil possibility from 9339-46 feet. Production test will be run.

Plant Converted

Great Southern Corporation, owner of a 6500-barrel daily capacity refinery near Corpus Christi, is converting its 100-octane gasoline unit that was acquired from the Defense Plant Corporation to process basis raw materials for synthetic rubber. The rubber output has been contracted for three years. Feeder stock will be supplied by the nearby natural gasoline plants of the Chicago Corporation and the Gulf Plains Corporation.

☆ Arkansas

Wildcat Completed as Small Pumper in Columbia County

Wildcat completed as small pumper in Columbia County; 3 wildcats fail in Ouachita County.

Columbia County: Atlas Oil and Refining Company et al's R. A. Wynns 1, wildcat in SWc 8-16s-19w, 5 miles northeast of McNeil and 2 miles south of

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shallow Stephens production was completed at 3500-12 feet in Pettit as a 30-barrel pumper. The oil having been uncovered in a new area, additional tests are expected. Total depth is 6627 feet.

McAlester Fuel Oil Company is waiting on pump for the completion of Alexander A-1, wildcat in NE SE 17-17-19, brought in from the Travis Peak with insufficient gas pressure to flow.

Ouachita County: J. W. Coan et al plugged Werner Saw Mill 1, C SE SE SW 28-15s-17w, at 3514 feet. The well is 2 miles east of the recently discovered Pace City field.

Jack Carnes et al abandoned Myar Brothers 1, C SW SW SE 14-13s-19w, 9 miles southwest of Troy field production, at a total depth of 2600 feet in the Travis Peak.

Curtis Kinard's Haltom Estate 1, C NW NW NW 4-15s-19w, was the third failure on the Ogemaw structure. It went to 3660 feet with no commercial showings. The area has been thoroughly explored in recent months without a commercial producer having been completed.

☆ Mississippi

Baxterville Field Outpost Is Successfully Completed

Northeast outpost of Baxterville field successfully completed; new Wilcox pay for Jefferson County field; tests continue in Superior's prospect.

Lamar County: Gulf Refining Company-Welch's John Q. Butler 1, SWc SE 32-2n-16w, has been successfully completed to extend the Baxterville field 1½ miles northeast. The well was perforated at 8898-8916 feet in the lower Tuscaloosa zone with 108 shots, and with packer at 8833 feet flow amounted to 116 barrels of oil per day through 3/16-inch tubing choke. Gas-oil ratio was 152/1 and gravity of the oil 14.9. Roeser & Pendelton's R. Batson 2, SWc 10-1n-16w, in Baxterville, was brought in with an initial flow of 560 barrels per day. Sun Oil Company's Snowden-Davis 1, NW C SW NE 7-1n-16w, also in Baxterville, flowed 505 barrels per day through ¼-inch tubing choke on initial test.

Jefferson County: Humble Oil & Refining Company's M. R. Smith C-1, 27-9n-1w, has been successfully completed to establish the Wilcox as a new pay zone in the Fayette field. The well was drilled to 11,100 feet in an effort to develop production from the Massive sand zone, regular producing section of the field, but oil sand also was encountered in cores at 9868-78 feet. The yield had no commercial potentialities and hole was plugged back to the Wilcox. Production was established from perforations at 3537-43 feet and the well brought in as a gasser with an initial flow rate of 1,910,600 cubic feet per day. The gas produced will probably be used to develop other properties in the field. Humble's J. Fred Gordon B-1, 44-9n-1w, deep wildcat, is drilling below 10,400 feet after a drill-stem test at 9944-65 feet in the lower Tuscaloosa recovered only mud and water.

Forrest County: The Superior Oil Company's Cassie Bradford 1, SEc SW NW 1-3n-13w, Mississippi's deepest wildcat, is reported to be continuing with tests after setting 5½-inch casing to 15,726 feet. Perforating tool is understood to have failed on account of high temperatures and a new tool is being brought in. Shows being tested probably are below the 14,000-foot zone, although the company is still keeping mum on developments.

Lincoln County: Crescent Drilling Company's J. F. Vernon 1, SEc 31-8n-7e, attempting to extend production northwest in the Brookhaven field, is bottomed at 10,504 feet while it attempts to fish out tubing which was twisted off. A drill-stem test with packer at 10,430 feet was run in the Massive sand zone, but after swabbing small amounts of oil, shows faded out and heavy salt water input was noted.

Issaquena County: C. H. Osmond's Anderson-Tully Lbr. Company 1, NE SW 9-17n-3e, drilling on the flanks of the Sharkey platform, is running core tests below 6685 feet with no shows reported. Cores taken at 6676-81 feet recovered fine white sand.

Warren County: A. W. Hutchings' B. N. Simrall 1, NEc 18-8n-5e, which was seeking oil in a Eutaw or Tuscaloosa pinchout, has been abandoned at a total depth of 8123 feet. Eutaw was topped at 6567 feet, Tuscaloosa at 7278 feet, and Massive sand zone at 8100 feet. No shows were encountered.

Florida

Gulf Refining Company's State 1, SWc 2-67s-29e, Monroe County, is drilling below 13,141 feet. Cores from 12,752-844 feet recovered slight shows of oil in lime stringers, and a show of dead oil was noted in cores at 12,869-881.

Osceola County: Humble Oil & Refining Company's Hayman 1, SEc 12-31s-33e, wildcat, is running core tests below 7604 feet with no shows.

Collier County: Humble Oil & Refining Company's Lee Cypress Co. 1, SW SE 28-47s-29e, on the flanks of the Sunniland field, has been junked and abandoned after losing wash pipe in the hole. Derrick was skidded 35 feet east for another test of the same structure.

☆ Michigan

Lake County Has Promising Traverse Oil Pool Opener

C. W. Collin's Pomorski 1, wildcat in SW SE SE 14-18n-12w, Cherry Valley Township, Lake County, flowed 33 barrels oil on swab test from Traverse lime pay at 2800-02 feet for a promising pool opener. Traverse, logged at 2795 feet, showed 300 feet of oil the first hour and 1800 feet in 22 hours in open 6-inch hole. Operator will acidize before deepening.

Union Drilling Company and V. I. Cilley are joint owners with Collin in the test. Sohio Petroleum Company, Cities Service Oil Company and Sun Oil Company control a large part of leased acreage in block.

The Lake County wildcat is about 8 miles due west of the Reed City field, which produced on isolated wells from the Traverse and had its main pay zone in the 3600-foot Monroe section.

Oceana County: The Carter Oil Company has spudded Miller 1, NE SW SW 11-13n-18w, following extensive core drilling operations indicating favorable closure and structure.

☆ Illinois Basin

Kentucky Has Two Strikes; Deep Test Resumes Drilling

Kentucky has 2 discoveries; deep test drills again; Illinois discovery completed.

Kentucky

Ashland Oil and Refining Company's Egle 1, 15-0-23, Henderson County, 2 miles north of the Dixie pool, is opening a new area with Pennsylvania sand production at 965-1000 feet. The pay section appeared excellent on electric log and no drill-stem test was taken.

McLean County: Miller and Schiarella's Wiggins 1, 20-N-27, 1½ miles south of the Panther pool, has opened a new area with production from Tar Springs sand at 1595-1645 feet. The well made 85 barrels of oil in 24 hours after a 160-quart shot.

Lincoln County: California Oil Company's Spears 1, 13-L-57, a rank wildcat which was reported ready for abandonment after drilling to the granite, was drilling again for the state's deepest test. With an abandonment order rescinded when the well was believed in granite at 5762 feet, operators went ahead and were drilling below 5916 feet in a soft formation.

Indiana

The Dodds-Bridge pool has been given a new pay horizon at Roy Meyers' Hayden 1, NE NW NW 10-8n-10w, Sullivan County. New production is from Salem lime at 1455-70 feet and the yield, natural, on pump was 300 barrels in 24 hours as operator continued testing. The pool has been producing from shallow horizons for many years, and in 1942 showed production in the Devonian lime.

Posey County: C. E. Brehm's Wolfe 1, NW NE NE 36-7s-15w, is a discovery ¾ mile east of the West Hovey pool. During a drill-stem test of Aux Vases sand at 2730-40 feet, the well showed gas in 25 minutes and then made 200 feet of oil and 60 feet of oil-cut mud.

Illinois

J. W. Rudy's Dewhirst 1, SE NE SE 16-5n-9e, wildcat in Jasper County, was completed for 54 barrels of oil per day pumping from Rosiclare at 3109-27 feet.

The Superior Oil Company's Worcester 1, wildcat in SE NW SE 8-5n-9e, is drilling below 2425 feet.

Hanock County: D. E. Lambert's Griffith 1, wildcat drilling with cable tools, is below 350 feet.

Wayne County: The Pure Oil Company's Molt 1, NW NW NW 5-1s-8e, is on production test after a 125-quart shot in McClosky lime, which is usually acidized. Prior to the shot the well was pumping 3 barrels of oil daily.

New Map Issued

A new map has been issued by the United States Geological Survey showing the oil and gas fields of the country, the major refining centers, and all major oil, gas and petroleum products pipe lines. The map is on a scale of approximately 40 miles to one inch, and shows oil and gas fields developed to March 1, this year. The Big Inch, Little Inch, the Tennessee Gas and Transmission Company's 24-inch line, the Plantation gasoline line and other lines built during the war are included in the network of pipelines shown on the map.

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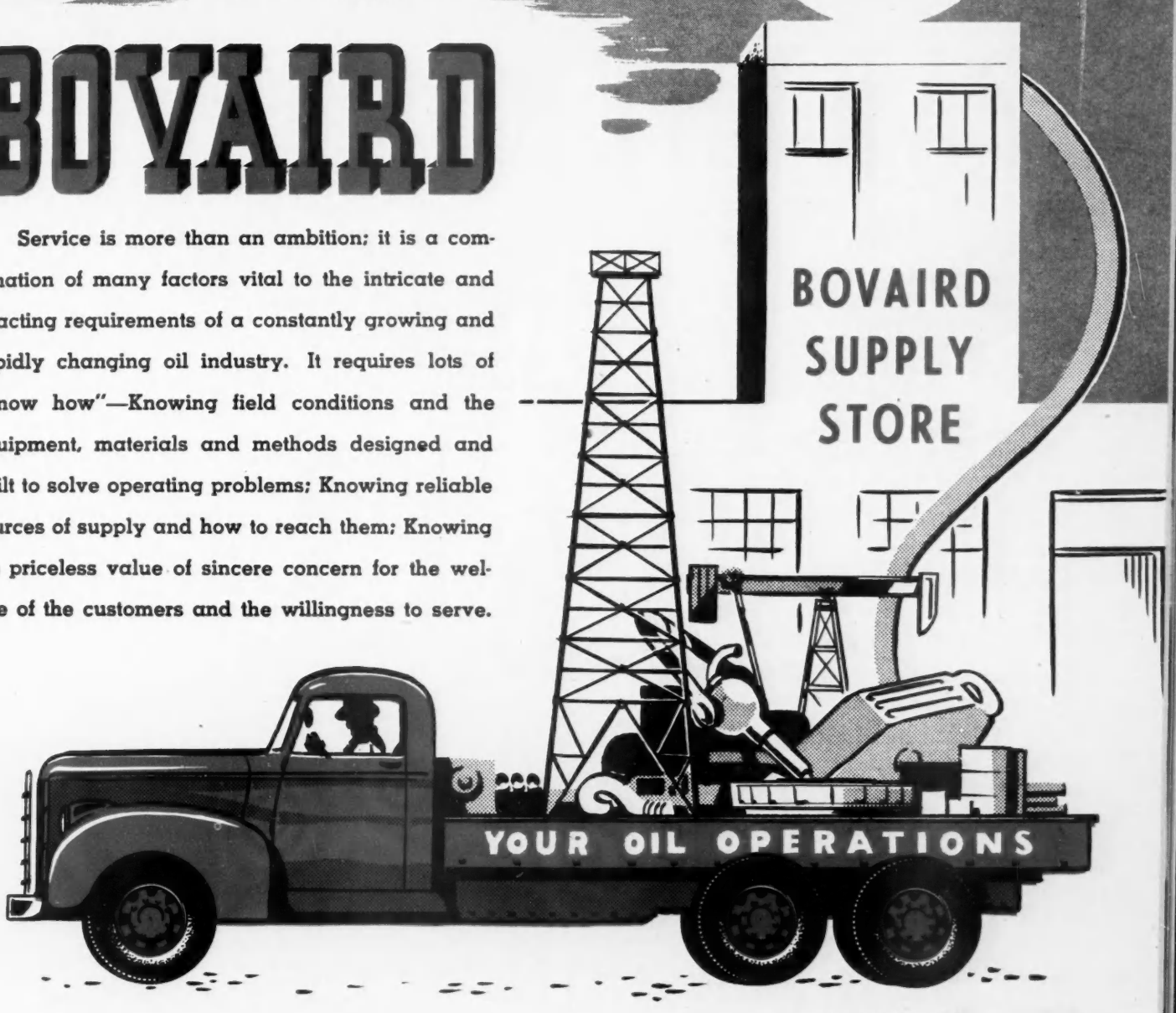

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☆ Ohio

Coshocton County Given Clinton Gas Discovery

Gas discovery made west of Coshocton; Mifflin extended south; Butler has oil extension; Berea discovery made at Woodsfield; two wells finaled at Five Mile.

Coshocton County: Benedum-Trees drilled through the Clinton in a semi-wildcat test in Bedford and Perry Townships with 425,000 cubic feet gas. Twelve hours after a 40 quart shot the well gauged 700,000 cubic feet. Clinton was logged at 3350-92 feet.

Ashland County: The Ohio Fuel Gas moved 1800 feet southwest to extend the Mifflin pool. Muskingum W. C. District 3, NE SE 23, Mifflin Township, logged the Clinton sand at 2411-21 feet with a natural gauge of 1,900,000 cubic feet.

Knox County: H. E. Perkins' Lulu Cullison 4, Lot 8, Butler Township, 2000 feet southwest of the No. 2, made 81 barrels in 24 hours after shot. Pay was in the lower Clinton sand, 2844-62 feet.

Monroe County: M. A. Gaughan has discovered a new Berea sand pool in Center Township, a mile south of the Kindelberger 1 in Sect. 16. The well, on K. A. Burgbacher, NW NW 15, had Berea sand at 1805-22 feet with 1¼ million cubic feet of gas at 720 pounds pressure.

Coshocton County: Two wells were completed on Five Mile Run in Pike Township 1. Dunmar Oil's Gilbert Ashcraft 1, NW SW 19, made 40 barrels from the Clinton at 3264-3311 feet. The Pure Oil Company's John McKee 2, NW SE 18, swabbed 33 barrels from Clinton sand at 3206-64 feet.

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☆ California

Wildcat to Be Drilled West Of Old Terra Bella Field

General Petroleum to drill wildcat 8 miles west of old Terra Bella field in Tulare County; test to basement planned in Jasmine area; Kern County's deep test near California depth record; East Los Angeles townlot wildcat plugged back for redrilling; East Huntington Beach well flows over 2000 barrels; salt water recovered in tests of 12,542-foot Kings County wildcat.

Tulare County: General Petroleum Corporation has staked location for Moran 42-30, a wildcat, in 30-22s-26e. Site is about 6 miles east of the town of Pixley and 8 miles west of the Terra Bella oil field where a small quantity of oil was produced from the Vaqueros in the 1930's. Union Oil Company drilled a dry hole to 4926 feet about 1 mile southwest of the new location. Last year Jergins Oil Co. drilled Cloer 1 about 4 miles east.

Kern County: Pacific Western Oil Company's National Royalties 1 in 5-26s-22e, a deep Vedder test, is expected to pass the California depth record soon with present bottom close to 16,200 feet. Record for the state is held by Standard Oil Company of California, which drilled KCL 20-13 in South Coles Levee to 16,246 feet two years ago.

Belridge Oil Company's South Belridge field deep test, 62-W-33 in 33-28s-21e, the state's second deepest well, is fishing with total depth 13,950 feet.

Los Angeles County: Mechanical difficulties have caused Richfield Oil Corporation to plug back in Boyle Community 33-1, wildcat in the builtup section of East Los Angeles. Well is being redrilled from 808 feet after drilling to 5902 feet.

Recovery on recent tests of the second well to be drilled in the North El Segundo field are not encouraging. Six Companies' Fee 2 in 2-3s-15w was tested between 6950-7000 feet and recovery was mostly mud and some oily mud.

B. F. Porter Estate's Sesnon Fee 2, originally completed and shut in last month, was opened and flowed 1440 barrels of clean 20.8-gravity oil through 24/64-inch choke. This is the lowest well structurally in the field.

Orange County: Morton & Sons (formerly. A. W. Lyddon, .Operator) will soon complete Irvine 7-1 in 7-6s-10w, East Huntington Beach. On a test of the interval 5410-5460 feet, the well flowed 3000 barrels gross, 30 percent cut.

General Petroleum's deep test near La Mirada, Community 46-1 in 16-3s-11w is coring at 11,700 in hard siltstone and sand. The test is about 1½ miles north of the operator's Librown 1, drilled last year to 12,600 feet. The latter well flowed 60 to 75 barrels of oil and about 12 barrels of water for a while but never produced commercially.

Kings County: Tests of a 10-foot interval at 12,542 feet in Kings County Oil Company's von Glahn. 1 in 4-23s-22e showed all salt water. Further tests will be made up the hole.

Solano County: National Investors Fund, Inc. has suspended operations in Burke & Donahoe 1 in 12-4n-1w, an attempt to extend the Potrero Hills gas field 1½ miles to the east.

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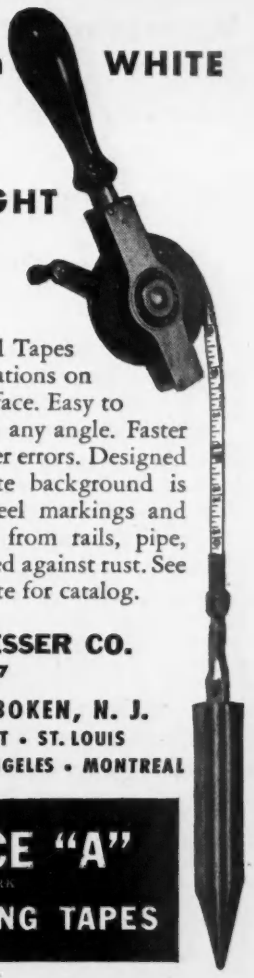

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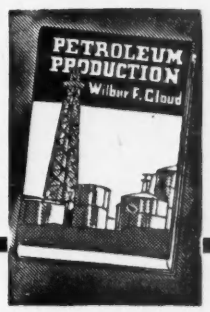

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☆ Rocky Mountain Area

Atlantic Prepares to Quit On Wyoming Sundance Test

Atlantic to abandon Sundance test in Wyoming; Lysite wildcat west of Casper is below 10,000 feet; Carter locates important basin test in Sweetwater County; Elk Springs, Colorado, Weber sand discovery is disappointment; West Dome, Montana, has Morrison pay extension.

Wyoming

The Atlantic Refining Company is preparing to abandon its Sundance test at Saratoga which it took over for deepening a month ago from independent interests. The well is Leverson 1, SW SE SW 30-18n-84w, Carbon County, and on drill-stem test at 4518-4703 feet in basal Sundance the recovery was 3725 feet of fresh water in 1 hour. Sundance formation was topped at 4370 feet, and total depth is 4703 feet. This test was on a long anticlinal fold southeast of Rawlins in a general area that has had no commercial production, but in several wildcat tests has had encouraging shows of oil.

Fremont County: General Petroleum Corporation is preparing to core at 9052 feet in the Frontier formation on its Antelope wildcat, 10 miles southwest of the Crooks Gap field. The well, 45-25-G, NE NE SW 25-27n-94w, has had no shows. The Crooks Gap field produces about 1500 barrels of 34 gravity oil per day from the Lakota sand at 4500 feet and recently a well on the southwest side of the field made 3700 feet of oil on drill-stem test in the Frontier, but was continued to the Lakota and completed in that horizon. Antelope is a seismograph structure worked by General Petroleum 2 years ago.

Sinclair Wyoming Oil Company's Unit 1, wildcat on the Lysite structure, 55 miles west of Casper, NE NE NW 35-39n-91w, is drilling below 10,000 feet, still probably in Cody shales, and projected for the Frontier section at around 11,000 feet. This well made 7,200,000 cubic feet of gas and some water from a sand, probably Shannon, between 9652-9693 feet 2 weeks ago.

Sweetwater County: The Carter Oil Company has made location for an important basin test 8 miles southeast of the Antelope well on a block of some 35,000 acres in the Great Divide area at Government 1, C NE NE 13-26n-93w. This is a projected test to Cretaceous or lower formations at depths below 9000 feet.

Colorado

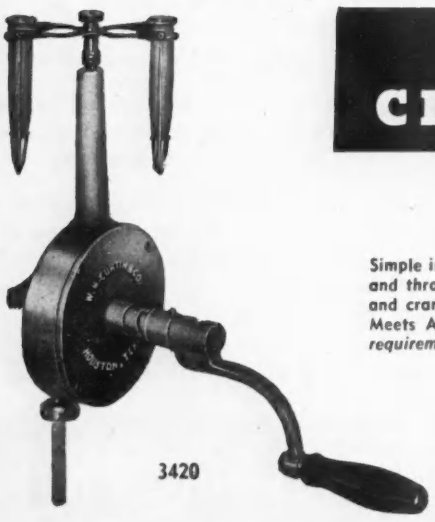
The Weber sand discovery at Elk Springs, Moffat County, first for Colorado this year, is a disappointment after plugging back for water shutoff to 6140 feet. The well, Continental's Smith 1, NW SE SW 30-5n-98w, swabbed 39 barrels of oil with only a trace of water in 15 hours, and the operator is preparing to shoot the hard, tight formation. This well topped Weber at 6086 feet a month ago and drilled and cored saturated sand to 6111 feet, when casing was run to the top of the formation. Below that depth the sandstone was extremely hard and tight and on drill-stem test below 6144 feet the well made water. Because of its proximity to the Rangely field, forty miles southwest, the discovery of oil at this location caused a great deal of leasing activity in the area. Even with the disappointing results of this test, many operators expect an accelerated exploration campaign in the entire Uinta Basin of Colorado and Utah during the coming year.

Montana

Development in the new Morrison (?) pay in the Cat Creek field, Petroleum County, has continued since its discovery a year ago at a more moderate pace than was indicated at the beginning of the campaign. But a new extension on the northwest side of the West Dome has been brought in at R. E. Chamberlain's Rhens 12-A, SE SE NE 9-15n-29e, flowing 480 barrels of oil per day after perforating Morrison between 1735-1783 feet. This is one of the largest producers in the area and may bring on further exploration on the west side of the field.

RMOG Speakers

Speakers at the annual meeting of the Rocky Mountain Oil & Gas Association in Denver, November 21-23, will include Joel D. Wolfsohn, assistant commissioner of the Bureau of Land Management, Department of Interior; Captain A. A. Nichoson, assistant to the vice president of The Texas Company, and Dr. W. O. Hotchkiss, geologist and president of Renselaer Polytechnic Institute, Troy, New York. The latter will speak before a combined meeting of the Rocky Mountain Oil & Gas Association, the Rocky Mountain Association of Petroleum Geologists, and the Denver section of the American Institute of Mining Engineers on the morning of November 23.



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Lloydminster-Long Rock Area Extended by Three Wildcats

Three wildcats have extended Lloydminster-Long Rock production, straddling the Alberta-Saskatchewan border, to a total length of 26 miles. The successes are along a 10-mile strip in Saskatchewan running southeast from Lloydminster field. Northeast Syndicates' DB-1, LSD 6 13-48-28w3, blew wild 3 hours November 11 after plug drilled. Gas flow measured 11,200,000 cubic feet plus considerable heavy oil. Operators brought the well under control and will squeeze cement in effort to shut off gas sand behind casing and permit completion of the well as an oil producer. Total depth is 1866 feet, with casing set at 1856 feet in the top of the Lower Cretaceous oil sand.

Husky Refining Company's OGD 4, Lone Rock discovery, LSD 14-17-27w3, has established a potential of 165 barrels daily of 17.9-gravity oil on the basis of a 6-day bailing test which started at the rate of 100 barrels of gassy oil per day and wound up at 270 barrels of gassy oil with fluid level holding 1350 feet from the bottom of the 1833-foot hole.

Withers Lone Rock 1, LSD 13 6-47-26w3, is bailing 5 to 6 barrels hourly of gassy oil with fluid level 800 feet off the bottom of 1790-foot hole, indicating a net oil potential of 75 barrels daily.

Oil is clean at all 3 wells and appears lighter than the 14-15-gravity crude of Lloydminster.

The first well in the 6-mile stretch separating 2 previous Madison limestone oil discoveries south of Princess appears the best Madison oil well on the Alberta Plains to date. South Princess Syndicate's 3, LSD 12 8-19-11w4, is flowing under back pressure through 9/64-inch choke, and made 63 barrels of clean 27-gravity oil in the first 24 hours against 100 pounds pressure on separator, 260 tubing, 400 casing. In the next 24-hour period the well made 70 barrels of clean oil against 50 pounds pressure on separator, 320 tubing, 610 casing. Initial acidization will be made in a few days. The well is bottomed 5 feet in Madison limestone at total depth of 3326 feet.

Shell Oil of Canada will drill immediately at Jumping Pound, in the deep Alberta foothills anticline west of Calgary. The new test is Shell 5-7-I, LSD 5 7-25-4w5, 2 miles southeast on line of strike from 1944's wet gas discovery. After spending nearly $3 million on Jumping Pound leasing, seismograph and 4 deep wells since 1941, Shell believes it has a commercial wet gas structure at depths of 9600-10,500 feet, although hopes of commercial oil production on anticline's west flank are dampened by water at 2 wells drilled following the crest discovery. The wet-gas discovery has open flow, a potential estimated at 20 million cubic feet of gas, plus up to 95 barrels of condensate daily with formation pressure of almost 4000 pounds.

Michigan Lands Leased

The lands division, Michigan Department of Conservation, leased 19,730 acres of wildcat land at public auction for a total bonus price of $5613. The average acre price of 28½ cents was the lowest in five years.

ARIZONA WILDCAT

Coconino County—Failure: Burrel Collins et al's Collins-Navajo Reservation 1, c se ne 36-34n-8e, abnd 10-8-46 at 1959 feet.

ARKANSAS WILDCATS

Ouachita County—Failures: Jack Carnes et al's Myar Bros. 2, sw sw se 14-13s-19w, 9 mi sw Troy fld, Travis Peak 2600, abnd 11-5-46 at 2610.

J. W. Coan et al's Werner Saw Mill 1, se se sw 28-15s-17w, ¾ mi sw Gum Crk fld, abnd 11-4-46 at 3514.

Curtis Kinard's Haltom Est. 1, nw nw nw 4-15s-19w, Ogemaw structure, Midway 816, Arkadelphia 1320, Nacatoch 1433-1590, Saratoga 1725-95, base Chalk 2008, Buckrange 2616, Blossom 2255, Tokio 2400, James 2580, Travis Peak 2630, abnd 10-31-36 at 3660.

CALIFORNIA WILDCATS

Kern County—Failure: Seaboard Oil Co.'s SWUM-BVA 73-4, 14-32s-25e, Buena Vista Lake area, abnd 11-4-46 at 12,553.

Orange County—Failure: Wood-Callahan Oil Co.'s Coyote 1, 4-3s-9w, Olinda area, abnd 11-5-46 at 1975.

ILLINOIS WILDCATS

Clinton County—Failure: Harry E. Miller's Fee 1, 12-1n-5w, abnd 570.

Effingham County—Failures: Inland Oil Co.'s Fuenneman 1, nw nw se 3-8n-6e, abnd 2516.

Inland Oil Co.'s Fuenneman 2, se nw se 3-8n-6e, abnd 2474.

Franklin County—Failure: Indiana Farm Bureau Co-Operatives' U. S. Fuel Co. 1, ne ne ne 2-6s-4e, abnd 3414.

Greene County—Failure: Earnest Zink's Wilhoit 1, nw nw se 18-12n-13w, abnd 540.

Jasper County—Oil Discovery: John W. Rudy's Deshirst 1, se ne se 16-5n-9e, pump 40 bbls fr Rosiclaire, 3108-09, td 3184.

Moultrie County—Failure: Robert D. Burns et al's Winings 1, sw sw nw 22-15n-5e, abnd 1802.

Richland County—Failure: J. S. Young, Jr.'s Highsmith 1, 4-2n-11w, abnd 1909.

St. Clair County—Failure: J. L. Jeffries' Lands 1, 25-1n-10w, abnd 543.

Shelby County—Failure: C. G. Davis' Pate 1, ne nw nw 9-11n-4e, abnd 1930.

Wayne County—Failure: Phillips' Golden 1, se se ne 28-1s-9e, abnd 3467.

INDIANA WILDCATS

Knox County—Failure: J. E. Bauer et al's Morris 1, 34-2n-11w, abnd 2078.

Posey County—Oil Discovery: Calvert & Willis' Wiley 1, sw sw ne 18-5s-13w, flow 226 bbls, fr McCloskey, 2974-84, td 3024.

Posey County—Failure: Nat Assoc Pet Co.'s Fuhrer 1, nw se nw 34-5s-14w, abnd 3053.

KANSAS WILDCATS

Ellis County—Failure: J. M. Huber et al's Furthmeyer 1, nw nw se 26-12s-18w, abnd 3520.

Kearny County—Failure: Stanolind's Kester 1, 25-21s-36w, abnd 2900.

Pratt County—Failure: Sohio et al's Stalcup 1, ne ne ne 15-26s-12w, abnd 4356.

Rice County—Failure: Stanolind's LaMunyan 1, se se se 3-19s-10w, abnd 3368.

Rooks County—Failure: Nadel & Gusman's Gouldner 1, se nw sw 9-18s-9w, abnd 3285.

Sedgwick County—Failure: H. H. Brown et al's Brown 1, c n½ ne nw 12-29s-2e, abnd 2180.

KENTUCKY WILDCATS

Henderson County—Failures: Sun's Ball 1, 24-P-22, abnd 2740.

McCummings Oil Co.'s Dorsey 1, 15-Q-25, abnd 2374.

NORTH LOUISIANA WILDCATS

Caddo Parish—Failure: Atlas O&R Co.'s C. R. Minor 1, nw 35-17n-16w, abnd 11-12-46 at 3018.

La Salle Parish—Failure: Placid Oil Co.'s La. Central 123, 1980 fr wl 660 fr sl 20-11n-3e, abnd 10-30-46 at 7325.

Richland Parish—Failure: C. M. Bagley Co.'s Greer Est. 1, sw ne 28-16n-7e, abnd 10-31-46 at 3355.

SOUTH LOUISIANA WILDCATS

Evangeline Parish—Failure: Delta Drlg. Co.'s Federal Ld. Bank of New Orleans 1, 667 n 300 w of c 12-5s-1w, 1½ mi w of Mamou disc well, abnd 10-20-46 at 11,900.

Tangipahoa Parish—Failure: Lion Chemical Corp.'s M. L. Varnade 1, 660 e&n of swc 38-2s-8e, abnd 11-6-46 at 9027.

SOUTH LOUISIANA NEW PAY TEST

Terrebonne Parish—Lake Barre Deep Gas-Distillate Discovery: Texas Co.'s State-Lake Barre Lse 199-45, 19-21s-20e, pay 11,900-30, perf 54 shots 11,915,24, flow 23 bbls 50.3-gr dist, 8/64-in, gor 32,000/1, tp 3500 lbs, comp 11-3-46 at 14,201.

MICHIGAN WILDCATS

Allegan County—Failures: Sleep and Broughton's Homrich 1, sw sw ne 5-4n-12w, abnd 11-5-46 at 1777.

Don L. Linsley's Hardin 1, sw se sw 7-2n-11w, abnd 11-8-46 at 1700.

Isabella County—Failure: J. V. Wicklund's Brown 1, se sw nw 19-14n-5w, Dundee 3618, abnd 11-9-46 at 3815.

Ottowa County—Failure: W. J. Hirzel's Geukes 1, sw sw se 12-5n-13w, abnd 11-4-46 at 1055.

MISSISSIPPI WILDCATS

Sharkey County—Failure: Stanolind's Mississippi 4, 16-11n-5w, abnd 10-30-46 at 5200.

Warren County—Failure: A. W. Hutchings Drlg Co.'s B. N. Simrall 1, c ne ne 18-8n-5e, Wilcox 2936, Eutaw 6565, Tuscaloosa 7278, Massive sd 8100, abnd 10-30-46 at 8124.

MISSISSIPPI OUTPOST

Lamar County—Baxterville Extension: Gulf-R. A. Welch's John Q. Butler 1, 32-2n-16w, 1½ mi ne prod, perf 108 shots 1 Tuscaloosa 8898-8916, flow 343 bbls, ⅜-in, gor 140/1, comp 11-1-46 at 9418.

MISSISSIPPI NEW PAY TEST

Jefferson County—Fayette Gas Discovery: Humble's M. R. Smith C-1, 27-9n-1w, perf 60 shots Wilcox 3537-43, flow 1,910,600 gas, open, comp 11-6-46 at 11,100.

NEW MEXICO WILDCATS

Chaves County—Failure: Magnolia's Black Hills Unit 1, c nw ne 31-17s-20e, elev 4905, Glorietta 830, Yeso 860, Hueco 3885, Pennsylvanian 4380, Mississippi 4695, Devonian 5145, Fusselman 5170, Simpson 5830, abnd in quartzite 11-9-46 at 6085.

Eddy County—Failure: Willis L. Lakey et

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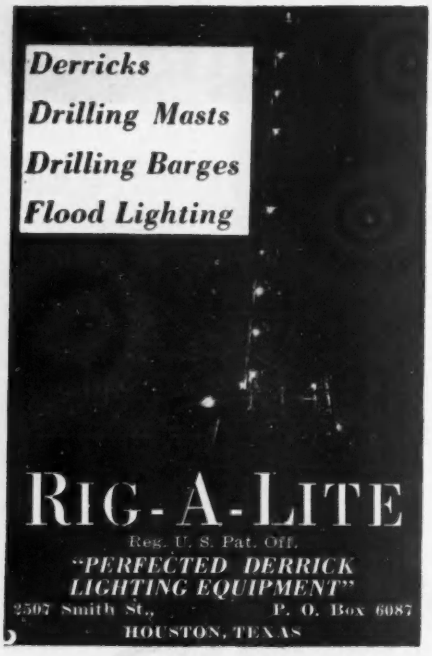

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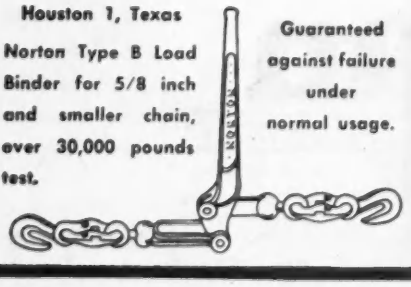

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al's Anderson 1, 2310 nsl 3630 wel 31-19s-28e, elev 3388, abnd 11-6-46 at 1074.

OHIO WILDCAT

Coshocton County—Gas Discovery: Benedum-Trees' John W. Lee 1, nw sw 16, Bedford Township, comp 11-4-46 at 3400.

OKLAHOMA WILDCATS

Cotton County—Failures: H. A. Hamilton's Powell 1, nw nw sw 32-2s-12w, abnd 2042.

Frank Murta's Hertzler 1, sw se ne 35-2s-13w, abnd 2804.

S. D. Johnson's Holmes 1, sw sw sw 20-2s-13w, abnd 2295.

Martin Prod. Co.'s Fletcher 1, se se nw 11-3s-11w, abnd 1722.

Meeker & Anderson's Kinder 1, nw nw ne 8-3s-12w, abnd 2005.

G. B. Howell's Jones 1, sw sw sw 15-4s-10w, abnd 2003.

R. L. Foree's Jones 1, se sw sw 17-4s-10w, abnd 2201.

Nixon Pet. Co.'s Ninz 1, ne ne se 34-4s-12w, abnd 2259.

Harper & Turner's Moyer 1, nw nw sw 2-4s-12w, abnd 2440.

Garfield County—Failure: Vickers Pet. Co.'s Andrews 1, sw sw sw 16-21n-4w, abnd 4784.

Garvin County—Oil Discovery: Carter Oil Co.'s Burford 1, nw nw 5-1n-1w, flow 463 bbls fr Pennsylvanian sd, 6070-88, td 7905.

Grady County—Failure: George P. Livermore's Giles Ranch 1, c nw nw 35-8n-5w, abnd 12,253.

Kay County—Oil Discovery: Continental's Wood 2, se se sw 19-25n-1w, flow 40 bbls fr Mississippi chat, 4303-49, td 4349.

Lincoln County—Failure: Deep Rock Oil Corp. et al's Collier 1, nw nw sw 6-13n-5e, abnd 3690.

Noble County—Failure: Big Bear Oil Co.'s Curby 1, nw nw sw 32-24n-2w, abnd 4710.

Pottawatomie County—Oil Discovery: James Wise's State 1, ne ne nw 16-10n-5e, pump 32 bbls fr Pennsylvanian sd, 3805-17, td 4754.

Seminole County—Failure: Norbla Oil Co.'s Black 1, se nw nw 10-9n-7e, abnd 3740.

WEST TEXAS WILDCATS

Bailey County—Failure: John W. Naylor-Bruce Sullivan's M. Wilson-Magnolia 1, 440 out nec labor 12, Lge 123, Childress CSL, elev 3864, anhy 2160, San Andres 3320, Celar Fork 5230, abnd 11-2-46 at 6003.

Brewster County—Failure: Arco Oil Co.'s Hopson 1, 1000 nsl 500 wel D&W 167, blk G-1, elev 2791, Glen Rose 565, abnd 11-6-46 at 830.

Scurry County—Failure: Seaboard Oil Co.'s Randall 1, 440 snl 761 wel H&TC Ry. 257, blk 97, elev 2492, anhy 730, San Andres 1820, Glorietta 2650, Clear Fork 2750, abnd 11-11-46 at 3310.

Upton County—Failure: C. A. Jones-Porter Rankin et al's Goode-Neal 1, 330 out sec HE&WT Ry. 23, blk B, elev 2562, San Andres 3885, abnd 11-5-46 at 4028.

WEST TEXAS NEW PAY

Andrews County—Block 12 Shallow Gas Discovery: Texas Co.'s University-Atlantic 2-T, 1985 nsl 665 wel sect 22, blk 12, se edge of field, flow 2,676,000 gas nat, open, fr Yates broken sand 2799-2950, comp 10-31-46.

WEST CENTRAL TEXAS WILDCATS

Erath County—Failure: T. G. Jackson et al's Migel 1, 660 out sec 223-ac tr and W. B. Waggoner sur, elev 1527, Ellenburger 3776, abnd 10-1-46 at 3937.

Stephens County—Failure: N. American Oil Consolidated-H. T. Owen's Couger 1, 1750 nsl 2250 ewl sect 2, J. Poitevent sur, elev 1174, Bend 3362, Marble Falls 3890, abnd 10-27-46 at 4160.

Taylor County—Failure: West Central Drlg Co.-Ungren-Frazier-Harry Raynolds' Rhodes 1, 330 snl 1573 wel T&P Ry. 16, blk 5, elev 2009-2209, Noodle Creek 2956-67, Flippen 2988, abnd 10-31-46 at 3953.

NORTH TEXAS WILDCATS

Archer County—Failures: Harvey Drlg Co.'s Abercrombie-Taylor 1-F, 1500 out nec blk 47, J. W. Harris sbdn, elev 1066, abnd 10-21-46 at 1480.

Harvey Drlg Co.'s Abercrombie 1-M, 1050 nsl 2000 wel blk 108, J. W. Harris sbdn, abnd 10-24-46 at 1467.

Harvey Drlg Co.'s Abercrombie 1-N, 1650 snl 1350 ewl blk 109, J. W. Harris sbdn, abnd 10-27-46 at 1460.

Archer County—Oil & Discovery: Staley Oil Co.'s Verda Powell 2, 275 nsl 1225 wel of 100-ac tr, and J. M. Armstrong sur, elev 986, pump 10 bbls sand 935-42-ft, comp 10-29-46.

Cooke County—Failures: Benson Bros. et al's Bordousky 1, 330 out nwc 94-ac tr, 1550 n 2631 w of swc J. Randolph sur, but in A. C. C. Bailey sur, elev 805, Ellenburger 4026, abnd 11-1-46 at 4058.

Sun's-Cason 1, 467 out nec 100-ac tr, 467 snl 1250 wel J. L. Hodges sur, elev 666, abnd in Penn 11-2-46 at 3770.

Young County—Failure: F. B. Paine Drlg Co.'s Huffman 2, 1800 snl 450 ewl TE&L Co. 1442, abnd 11-2-46 at 622.

SOUTH CENTRAL TEXAS WILDCAT

Atascosa County—Failure: Magnolia's E. A. Kinsel 1, 660 fr ne&sel Green B. Tankersly sur 468, in m/ely/e cor sur, 6600 s sw Mull prod, abnd 10-30-46 at 3010.

SOUTHWEST TEXAS WILDCATS

Duval County—Failures: Hewit & Dougherty's Peter McBride 1, 330 fr s&el lot 4, blk 20, addn 5, Realitos sbdn of Copita Farm & Garden trs, Santos Garcia Gr, on 240-ac lse, abnd 1 10-31-46 at 5615.

H. H. Howell's Lizzie Singer 4, 3288 fr el 793 fr sl SK&K sur 241, e flk of Palangana salt dome, abnd 11-1-46 at 2438.

Starr County—Failure: Sun's Pedro G. Rodriguez 1, 467 fr el 660 fr m/sly/sl 224.58-ac lse, in sh 10, La Sal Colorado Gr, 4000 n of N. Sun prod, abnd 10-31-46 at 7505.

Webb County—Failures: Dulaney Oil Co.'s Frost Nat. Bank 2, 2305 fr sly/sl 780 fr wl A. Chapa sur 604, 1 mi w Mirando City fld, 698-ac lse, abnd 10-30-46 at 1808.

O. W. Killam's E. Garcia Heirs 2, 330 n of sl 4000 w of el sur 2363 on 160-ac lse, 2 mi e Mirando City fld, 1 mi se Hughes fld, abnd 10-30-46 at 1957.

Magnolia's Billings Ranch 2, 2310 fr el 2310 fr sl CCSD&RGNG sur 52, blk 1 on 11,570-ac lse, 4 mi w sw Lopez fld, 5 mi ne Carolina-Texas fld, abnd 10-30-46 at 3020.

LOWER TEXAS COAST WILDCAT

Jackson County—Failure: Hewit & Dougherty's Jennie Williams Est. 1, 467 fr nel 439 fr nw&sel 250-ac lse, 3700 fr sel 467 fr nel Wm. Whitaker sur, 6000 n ne Johnson 1 gas disc at Morales fld, abnd 10-22-46 at 4760.

LOWER TEXAS COAST NEW PAY TEST

San Patricio County—Midway Oil Discovery: F. M. Boykin, Jr.'s H. H. Hutte 3, 467 fr wl 660 fr nl sect 81, Geo. H. Paul's sbdn Coleman-Fulton pstr lds, 160-ac lse, pay 5680, perf 7 shots 5685-86, flow 164 bbls 31-gr oil, 9/64-in, gor 1380/1, tp 1060 lbs, comp 10-27-46 at 6057.

San Patricio County—W. Sinton Oil Discovery: Jones & Morgan's W. Ford 1, 330 fr s&wl blk 29, J. J. Welder sbdn, John Pollan sur and 28.6-ac lse, pay 3460, perf 24 shots 3462-68, flow 151.2 bbls 21-gr oil, 89.7% wtr, ¾-in, no gas, comp 10-23-46 at 5231.

UPPER TEXAS COAST WILDCATS

Chambers County—Failures: Gulf's W. F. Mayes et al 2, 192.7 fr el 1980 fr wl 365 fr sl 278-ac tr on 8066.26-ac lse, Victor Blamche sur, 8100 n of nearest prod at Lost Lake Dome, abnd 10-27-46 at 8290.

John W. Mecom's Ker Cade et al 2-B, 300 fr sel 300 fr swl C. T. Cade sur and 575-ac lse, se flk High Island fld, abnd 11-2-46 at 8707.

Texas State Drlg Co.'s D. Lundquist 1, 330 fr n&el 40-ac tr which is n½ n½ sw¼ sect 91 H&TB sur, 1½ mi w Elm Bayou gas prod, abnd 11-1-46 at 6878.

Fort Bend County—Failure: H. M. Amsler's Mary C. Beirne et al 1, 330 fr swl 660 fr sel 320-ac lse, which is nw½ of sect 75, H&TC sur, abnd 10-26-46 at 4705.

Montgomery County—Failure: Humble's W. M. Wickizer 1, 676.5 fr el 2579.5 fr nl 329-ac lse, P. Harrison sur, abnd 11-6-46 at 11,320.

WYOMING OUTPOST

Hot Springs County—Zimmerman Butte Failure: Pacific Western's Unit 4, nw sw ne 35-44n-93w, Dinwoody 4345, Phosphoria 4410, abnd 11-3-46 at 4422, pb 4408.

WYOMING NEW PAY TEST

Hot Springs County—Lake Creek Deep Failure: Continental's Government 2, sw se sw 27-43n-91w, Embar 3250, Tensleep 3590, Amsden 3903, Madison 4230, abnd 10-30-46 at 4465.

Acidizing Station Opened

The Acid Engineering Company of Kansas has opened an acidizing station at Lakin, Kansas, and will offer oil and gas well chemical services for Southwestern Kansas. Steele S. Neely, formerly with the Hinderliter Tool Company, is resident agent and sales representative of the new station. E. S. (Jack) Villines is co-owner and general manager with offices at Garden City, Kansas, and Lakin.

The company will retain its treating station in Tulsa, with H. L. Stevenson as the station manager.

Arkansas Field Named

McAlester Fuel Company's Adams Estate A-1, SW NW 16-16s-24w, Lafayette County, Arkansas, has been designated as the discovery of the West Lewisville field. It is west of the townsite and 3 miles east of the Hyrum Moore Estate 1, C NW SE 14-16s-25w, Spirit Lake discovery of Austin E. Stewart and H. G. Lewis, Jr. The Adams Estate A-1 was finaled as a pumper October 8, making 201 barrels of fluid daily, 72 percent oil, from the Rodessa section at 3977-92.

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■ Cardwell K. L. Double Drum Rotary Draw Works. G. K. 145 Waukesha engine, perfect condition, can see operating. New 34 Tulsa Winch. 5-sheave 100-ton Dreadnaught Crown Block. P. O. Box 709, Phone 596, Conroe, Texas

■ All-steel, shop-built 500-ft. water well spudder mounted on 4-wheel trailer, 600'-⅝" drilling line; 350'-⅜" sandline, with following tools: One swivel socket; one 3½" x 14' stem; five bits 5", 6" & 8"; three bailers 4", 6" & 8"; circle track and wrenches; 6⅝" casing elevator, spider, slips and driving clamps, also other small tools necessary for operation. Price $2,000.00. P. O. Box 111, Coldwater, Kansas

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SITUATION WANTED

■ Material man desires connection with individual or independent company. 15 years experience in production and drilling departments, purchasing, inventorying, warehousing, etc. Box 91, The Oil Weekly, Houston.

■ Subsurface Geologist, masters degree, over seven years experience, knowledge of geophysics, production and drilling. Now employed by major company. Want position with strong, aggressive independent. Address: Box 93, c/o The Oil Weekly, Houston, Texas.

■ Subsurface Geologist, B.S. degree from Texas A.&M. College, four and one-half years experience subsurface, sitting on wells, correlations. Now employed by major oil company, want position with future. $400 per month. Address: Box 94, c/o The Oil Weekly, Houston, Texas.

HELP WANTED

■ Geologists, Micropaleontologists, Petrographers, and Petroleum Engineers wanted for service with major oil company in South America. Salary dependent on qualifications. Applications may be made in person or by letter to: Gulf Oil Corporation, New York Production Division, 17 Battery Place, New York 4, N. Y., Room 1633.

■ We have calls for one oil well supply price specialist, one oil well supply office man, one industrial gas sales engineer. No agency charge. Oil Industry Employment Service, P. O. Box 2603, Tulsa, Okla.

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HELP WANTED

SEISMOLOGIST

Seismologist wanted by major oil company operating in Gulf Coast and Mid-Continent. Position involves review interpretation of work done by various seismic contracting companies and requires familiarity with correlation, dip and continuous-profile computing techniques. Geological background desirable but not essential. Location in Houston, Texas. State in first letter education, age, experience, salary expected and date available. Our employees in this category know of this advertisement. Box 95, c/o The Oil Weekly, Houston, Texas.

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■ Manufacturer's Representatives: Large specialty well service organization servicing producers, wish additional lines for sale or service on Gulf Coast, Texas and Louisiana. Box 80, c/o The Oil Weekly, Houston, Texas.

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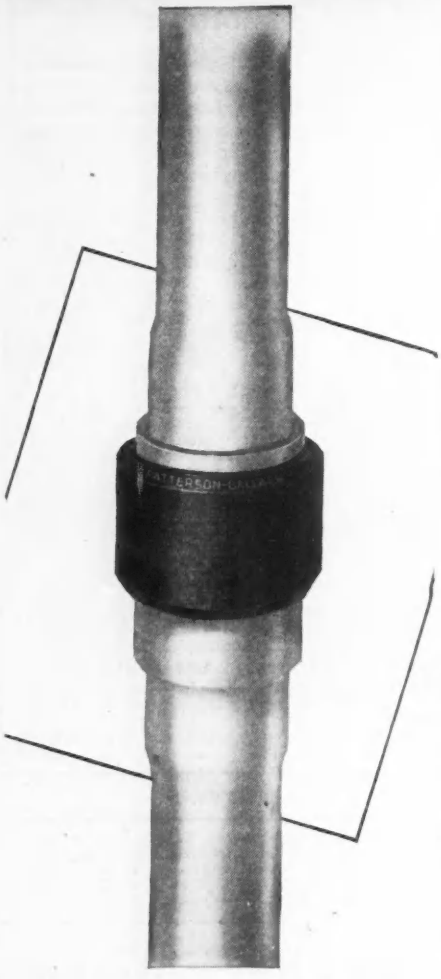

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SQUEAKS from the BULL WHEEL

Life Can Be Simple

"What's that mark on your nose?"
"Oh, they were made by glasses."
"You should learn to tilt your head back. It pours easier."

Short Cut

"Where's that pretty blonde who was passing out cocktails a minute ago?"
"Oh, you lookin' for a drink, lady?"
"No. I'm looking for my husband."

The Very Idea!

A hotel clerk refused to give a couple a room. "Frankly, I don't think you're married."
"Sir!" screamed the lady. "If my husband were here, he'd make you eat those words!"

Another Theory Exploded

"I don't believe in pre-natal influences. Just a lot of bunk. Why, just before I was born my mother broke an armful of phonograph records and it didn't do me no harm, no harm, no harm, no harm."

Grapes of Wrath

"I want some grapes for my sick husband. Do you know if any poison has been sprayed on them?"
"No, ma'am. You'll have to get that at the druggist's."

The Woman's Way

"I've insured my life for $10,000 so that if anything happens to me, you and the children will be provided for."
"How thoughtful of you, darling. Now you won't have to see the doctor every time you feel sick, will you?"

Golden Silence

"Every time I hear one of those musical auto horns I get scared."
"How come?"
"Because the fellow who ran off with her had one on his car, and when I hear one of those horns I'm afraid he's bringing her back."

The Gentle Way

A boy was told to report to a woman that her son had been killed in a fall, but warned that he must break the news in a tactful manner.
"Mrs. Smith, here's an apple that I owe your son."
"What for?"
"Well, we had a little bet about who could lean out of the window the farthest—and your son won."

That's Telling Him!

A tough employer noted for his energy saw a boy leaning idly against a packing case whistling.
"How much are you getting a week?" he demanded.
"Twelve dollars."
"Here's a week's pay. Now clear out. You're through."
As the boy pocketed the money, shrugged and strolled away, the busy man turned to the stockroom clerk. "How long has that kid been with us?"
"Him?" said the clerk. "Oh, he just brought over a package of bolts and nuts."

How to Be Helpful

"Is Evelyn your oldest sister?"
"Yep."
"And who comes after her?"
"You, three sailors, and the ice man."

Hints for Householders

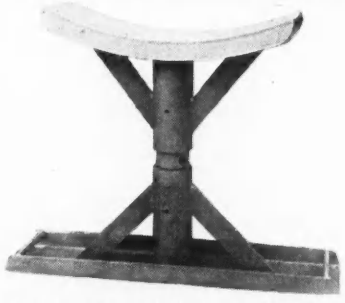
"Would you lend a friend $5?"
"Would if I had one. But I haven't a friend in the world."

Petty Detail

"There I was, forced down on a desert island with five lovely blondes."
"Gee, what did you do for food?"
"Derned if I remember!"

OWEN

LEVEL YOUR BOILERS AND LOWER YOUR EXPENSES



Poor barrel support is one cause of costly boiler repairs. Flues and staybolts often fail because of stress and vibration resulting from poorly supported, uneven boilers.

Avoid high boiler maintenance costs by supporting and leveling your boilers with Owen Boiler Jacks. These sturdy jacks enable one man to level boilers and keep them level with a minimum of effort. The heavy chanel iron cradle is rolled for perfect fit; the base is wide and rigid for steady support and the heavy screw, operated by a bar, lifts heaviest loads with ease. Welded construction throughout assures long service.

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HOUSTON

MEN IN THE INDUSTRY NEWS

W. E. Morgan has been made division land manager in the Pacific Northwest by the Union Oil Company with headquarters in Seattle. **J. E. Koogle** has been appointed San Joaquin Valley division landman, with headquarters in Bakersfield, and **H. K. Said** is now coastal division land manager, with headquarters in Santa Maria.

»

D. W. Woods has been appointed general counsel of General Petroleum Corporation. Woods is secretary of the company, and has been manager of the legal department.

»

L. C. Kemp of Houston has retired from the legal department of The Texas Company after almost 25 years of service. He will engage in private law practice, specializing in land title work.

»

Mr. and Mrs. Harry C. Wiess of Houston last week made a gift of more than $1 million to Rice Institute, Houston. The gift provides that the Institute will receive the income from 30,000 shares of Humble Oil & Refining Company stock for a period of 17½ years, which is estimated to amount to more than $1 million. Wiess, Humble president, has served on the Rice Institute board of trustees since 1944.

»

Charles A. Warner, vice president and head of the land department of the Houston Oil Company of Texas, spoke on "The Functions of the Land Department of an Oil Company" before the Petroleum Engineering Club of Texas A. & M. College, November 7.

»

Harry P. Stolz of the consulting firm of Stanley and Stolz, Los Angeles, has been retained as a consultant for the Navy in matters pertaining to the Elk Hills Naval Oil Reserves and has left for Washington. During the war, Stolz was a captain in the Navy and had charge of the Elk Hills oil development.

»

Russell F. Hunt, president of Income Shares Corporation, Delaware corporation capitalized at $800,000, with headquarters at Tulsa, has obtained permit to operate in Texas.

»

Gene Bennett, San Antonio; **Dewey E. Myers** and **Chester L. Robinson,** Indianapolis, and **E. T. Reibold,** Dayton, Ohio, have organized The Colorado Company with a Texas charter to engage in drilling and production activities. Headquarters are in the Alamo National Bank Building, San Antonio.

»

Rush Greenslade of Gulf Refining Company, **Ben Lowery** of Phillips Petroleum Company, and **A. J. Rosenlieb** of The Ohio Oil Company were elected to serve for the remainder of the year on the board of directors of the Illinois Oil & Gas Association. No first vice president was elected to replace **C. C. Carroll,** deceased. **Walter Duncan, Sr.,** will continue as the only vice president for the rest of the term.

W. W. Bruce, executive vice president of Continental Oil Company, Ponca City, Okla., has retired after 18 years of service. He became secretary and treasurer of a company formed by officials of The Texas Company, that connection leading to his going with The Texas Company in the early 1900's. He became assistant secretary of the company and was made treasurer in 1920. He joined Continental in 1928.

»

O. C. Nonweiler, Springfield, Mo., has been appointed general superintendent of the Ajax Pipe Line Corporation, with headquarters in Springfield. Formerly with the Interstate Oil Pipe Line Company, Tulsa, Nonweiler has been acting superintendent of the Ajax system since July 1, 1943. Before that time he was chief engineer of Interstate Company, with offices in Tulsa.

»

George N. Powell, 69, traffic manager for the Southern Group of Pipe Lines for 34 years, has been retired. He took over the position of traffic manager in 1912 with the pipe lines unit at that time composed of the Cumberland, Southern Eureka and South West Pipe Lines companies. In 1931, when the Cumberland unit separated from the other companies he continued his work and handled tariffs for the other three firms.

»

Dr. William O. Hotchkiss, president of the Society of Economic Geologists and president-emeritus of Rensselaer Polytechnic Institute, spoke on "The Non-Fuel Minerals and National Defense" before the Houston Geological Society. Dr. Hotchkiss recently completed an assignment as a brigadier general in the United States Army Specialist Corps in which he was intimately associated with mineral resources and their importance in world affairs.

»

R. M. Bauer, gas supply supervisor, Southern California Gas Company and Southern Counties Gas Company, presented a paper, "Texas Natural Gas for California," at the November 7 meeting of the California Natural Gasoline Association in Rio Hondo Golf Club, Downey, Calif. He told how the Southern California population has outgrown the state's gas reserves, and described the $70 million Texas-California gas line.

»

James H. Quick and **Frederick Ingalls** have been appointed assistant advertising managers for General Petroleum Corporation. Quick will work in sales promotion and Ingalls will assist manager **Frank Meunier** in advertising. Quick has spent 20 years with Standard Oil Company of Indiana, and was executive assistant in North American Aviation's public relations department since 1943. Ingalls was advertising manager for Forest Lawn Memorial Park, Glendale, Calif., for two years.

»

Paul M. Pope, Sr., Houston, and **L. P. Auxier,** Miami Beach, Fla., have incorporated the Apex Oil Company as a Texas corporation with headquarters at Houston.

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Solve your tough communications problems by using this equipment. Proved during war and doubly preferred by Communications men in all branches of the oil industry.

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MEN IN THE INDUSTRY NEWS

E. C. Sidwell, producer in the Texas Panhandle; **R. W. Sidwell** and **E. E. Shelhamer**, all of Pampa, Texas, have organized the Beacon Supply Company, with capital stock of $50,000.

»

A. A. Nicholson of The Texas Company will speak on "Free Enterprise—the Business Stabilizer," at the December 3 meeting of the Illinois Basin Chapter of the API at Evansville, Ind.

»

W. D. Appling, Russell M. Johnson, F. W. Melcher and **Warren A. Smith,** all of El Campo, Texas, have organized the W. D. Appling Drilling Company.

»

A. L. Miller, O. O. West and **Robert P. Miller,** all of McAllen, Texas, have incorporated the Hidalgo Oil & Gas Company, Inc.

»

Homer E. Ogden of Coleman has been appointed Texas manager of operations of the Peg-og Syndicate, Denver, firm engaged in drilling its first wildcat in West Central Texas. **W. Richard Means,** Denver, is president.

»

Martin J. Rampp has been appointed manager of oil field sales, eastern division, International Derrick & Equipment Company. His headquarters will be at Marietta, Ohio, where he will continue to manage the Marietta plant in addition to his new duties.

Herman V. Gaertner, assistant treasurer of The B. F. Goodrich Company, has been elected controller following the retirement of **T. B. Tomkinson.** Gaertner, who was appointed assistant controller in 1929 and assistant treasurer in 1943, joined B. F. Goodrich in 1916 as a clerk in the company's accounting division.

Herman V. Gaertner

»

S. Allan Greer, president of the R. O. Gould Company, Long Beach, Calif., producing firm, has obtained permit to operate in Texas with capital stock of $100,000.

»

Jerry C. Hawkins, Dallas producer and rotary contractor, and **John Webb Graham,** Houston, have organized the Hawkins-Graham Drilling Company, Inc., with headquarters at Dallas.

»

A. F. Keating, president of the Keating Drilling Company, which maintains headquarters in the National Bank Building, Tulsa, has procured permit to operate in Texas.

John P. Barton, for the past two years topographical draftsman with the U. S. Engineers, has joined Sunray Oil Corporation as a senior draftsman.

»

Dr. Willard H. Dow, president of Dow Chemical Company, has been awarded a gold medal and scroll as "Man of Science" by the magazine *Science Illustrated.*

»

E. J. Coenan, geologist with General Petroleum Corporation, Bakersfield, Calif., is leaving for the Dutch East Indies, where he will be geologist for Socony-Vacuum Oil Company, with offices on Sumatra.

»

Homer W. Snowden, Dallas independent who has carried on a substantial drilling program the past several years in Texas and Oklahoma, has obtained a Texas charter for the Texmass Petroleum Company, with capital stock of 100,000 shares of non-par value. Incorporators of the firm include: **J. Dudley Clark, Henry I. Harriman** and **Dudley L. Milliken,** all of Boston, Mass., and **Gordon D. Harriman,** Dallas.

Deaths

John S. Aston, 32, development engineer with The Texas Company, Los Angeles, died in an oil field accident November 1. Born in Chicago, Aston had been with the company since his graduation from Stanford University in 1938.

»

William Carl Jones, 60, retired oil operator, died in Oklahoma City November 11. He had moved to Oklahoma City recently from Pampa, Texas. He was engaged in business in Independence, Kansas, and Tulsa a number of years ago.

»

Frank J. Hearty, former president of F. J. Hearty & Co., Los Angeles and San Francisco, and veteran west coast representative of Edward Valves, Inc., died November 3.

»

Reese S. Allen, 74, who shared in the discovery of the K-M-A field, which became the most important field in North Texas through the finding of new pays, died November 7 in Austin, Texas. He had resided at Electra, Texas, since retiring.

»

L. A. Pendergraft, pipe line foreman for the Goodrich district, Polk County, Texas, United Gas Pipe Line Company, died November 8. He had been with United since May, 1924.

»

Preston J. Lea, 70, pioneer Texas operator, died November 11 in Wichita Falls after a long illness. He participated in the development of the Spindletop field, and moved to North Texas in 1917.

These two Model VE-4 20 hp., 4-cylinder Wisconsin Air-Cooled Power units provide steady-going, all-weather dependability, driving rotary Lub-Oil pumps for a major oil company near Odessa, Texas.

No matter what type of equipment or power application the job calls for, Wisconsin Air-Cooled Engines deliver heavy-duty serviceability, easy starting in any weather, and complete freedom from cooling chores and troubles. Supplied in 4-cycle single cylinder models, from 2 to 9 hp., and V-type 4-cylinder models from 9 to 30 hp.

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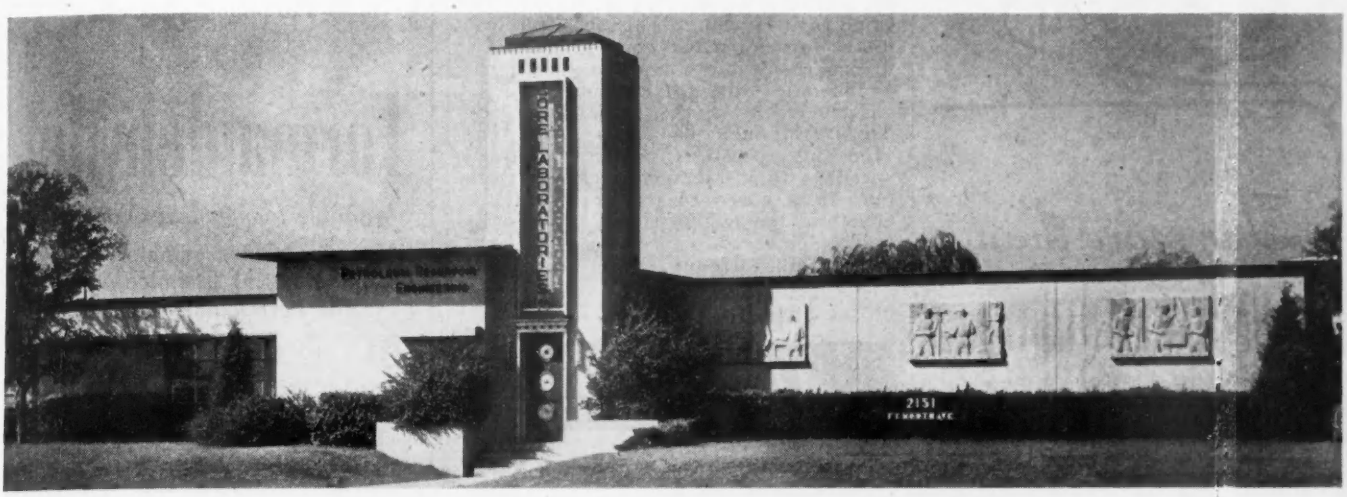

Core Laboratories, Inc., Dallas, has moved its research laboratory and general offices and personnel to a new location on Fort Worth Avenue. At the same time, the North Texas Division and the Reservoir Fluid Analysis laboratory, formerly with the general offices at Highland Park Shopping Village, have been established at 6923 Snider Plaza.

Reconditioning Service Opened By Brown's West Texas Store

Brown Well Service of West Texas celebrated the opening of a shop at Odessa, Texas, with a barbecue for several hundred operating men. The new shop is furnishing service on reconditioning drill collars, subs and Kelly joints.

H. C. Brown

H. C. Brown, vice president and manager of operations for Brown Well Service of West Texas, is one of the organizers of the service. A veteran in oil tool shop management, he began as an apprentice with Union Tool Company at Taft, Calif. He joined Baash-Ross Tool Company in 1919 and resigned January 1, 1946, to enter business for himself. C. C. Brown, head of Brown Oil Tools, Inc., Houston and Brown Well Service in the Gulf Coast, is president of Brown Well Service of West Texas.

Factory and Office Building Planned by Marsh Corporation

The Jas. P. Marsh Corporation, manufacturers of pressure gauges and other industrial instruments, will start immediate construction of a factory and office building on a five-acre tract of land at Howard Street and St. Louis Avenue, Stokie, a suburb of Chicago.

The buildnig will be a one-story unit of concrete and steel with cut stone facings, and with a monitor-type roof to provide maximum light. The general offices will be air-conditioned and soundproofed. The heating system will be manufactured by the company itself, and the building will be a testing ground for extensive research on heating methods.

The company celebrated its 80th anniversary in 1945. Originally organized in 1865 as a one-man business, it now has sales offices in all the principal cities of the U. S., Canada, and many foreign countries.

Marketing Service for New Inventions Is Announced

National Merchandisers, Chicago, has announced a marketing service for new inventions. The division will assist the small or average inventor from the inception of his idea to placing the finished device or article on the market. Much of the firm's activity will center around engineering analyses, market surveys, and invention sales. Inventions which fail to stand up under investigation are returned to their owners. The firm's methods are described in a booklet, "A 12-Point Program for Inventors," which may be obtained from the company at 28 East Huron Street.

Three Vice Presidents Named By Wilson Supply Company

Several changes in executive personnel have been made by Wilson Supply Company. R. W. Jeffery, L. R. Bandy and George W. Gist have been made vice presidents. Jeffery was formerly secretary and treasurer of the company. Bandy and Gist were salesmen.

J. S. Roberts is now secretary and treasurer, having promoted from assistant secretary and treasurer. J. W. King, who was auditor, is now assistant treasurer, and A. L. Pippert is assistant secretary.

Quaker Adds V-Belts

Quaker Rubber Corporation, Philadelphia, has added industrial V-belts to its line of rubber products. Features claimed for the product are flexibility, heat resistance, abrasion resistance, and balance.

Nowery J. Smith Firm Enlarges Hot-Dipped Plant Facilities

The Nowery J. Smith Company, which sold its steel fabrication division to Parkersburg Rig and Reel Company November 1, is enlarging the activities of the hot-dipped plant which the company retained. The plant will engineer additional corrosive protection methods in coatings, chrome and plastic, and will warehouse various galvanized and specially-coated steel products for both the oil industry and industrial trade.

Nowery J. Smith

New Foreign Department Chief Is Named by Monsanto Company

John L. Gillis has been appointed head of the foreign department of Monsanto Chemical Company, St. Louis. Gillis, formerly general export manager and assistant director of the department, succeeds Arnold H. Smith, head of the department the past year, who has been named representative of the executive committee in Australia.

Monsanto operates two plants in Melbourne. Laucks Austria Pyt., Ltd., a subsidiary of I. F. Laucks, Inc., owned wholly by Monsanto, operates a third plant in Brisbane. Gillis returned to Monsanto in 1945 from Johnson & Johnson International, where he was vice president.

Murray Moves Offices

The Murray Tool & Supply Company has moved its general offices to 1703 S.E. 29th Street, Oklahoma City, with a mailing address at P. O. Box 4351.

For more than a

QUARTER-CENTURY . . .

The OIL WEEKLY has performed a specialized editorial service for the worldwide drilling, producing and pipe line industry. Year after year, more and more men engaged in this specialized business have added their names to the growing list of subscriber-readers to the point where today there are few men of authority in the oil producing business who do not make a habit of reading *The* OIL WEEKLY.

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The OIL WEEKLY

FOR THE DRILLING-PRODUCING AND PIPE LINE INDUSTRY

Houston · New York · Cleveland
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Turney Four-Speed Draw Works Exhibited at Hunt Tool Firm

The initial showing of a new Turney four-speed draw works, powered with General Motors diesel engines, furnished by Stewart & Stevenson Services, Houston, was held at Hunt Tool Company, Houston. The occasion was in the form of a barbecue, attended by drilling contractors and oil men from France and other foreign countries.

Turney draw works, manufactured by Turney Manufacturing Company, Inc., Houston, operates on a variation of speeds with instantaneous change from one drum speed to the other without changing the engine speed. The power unit is powered with three twin General Motors diesel engines, Models 12101.

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